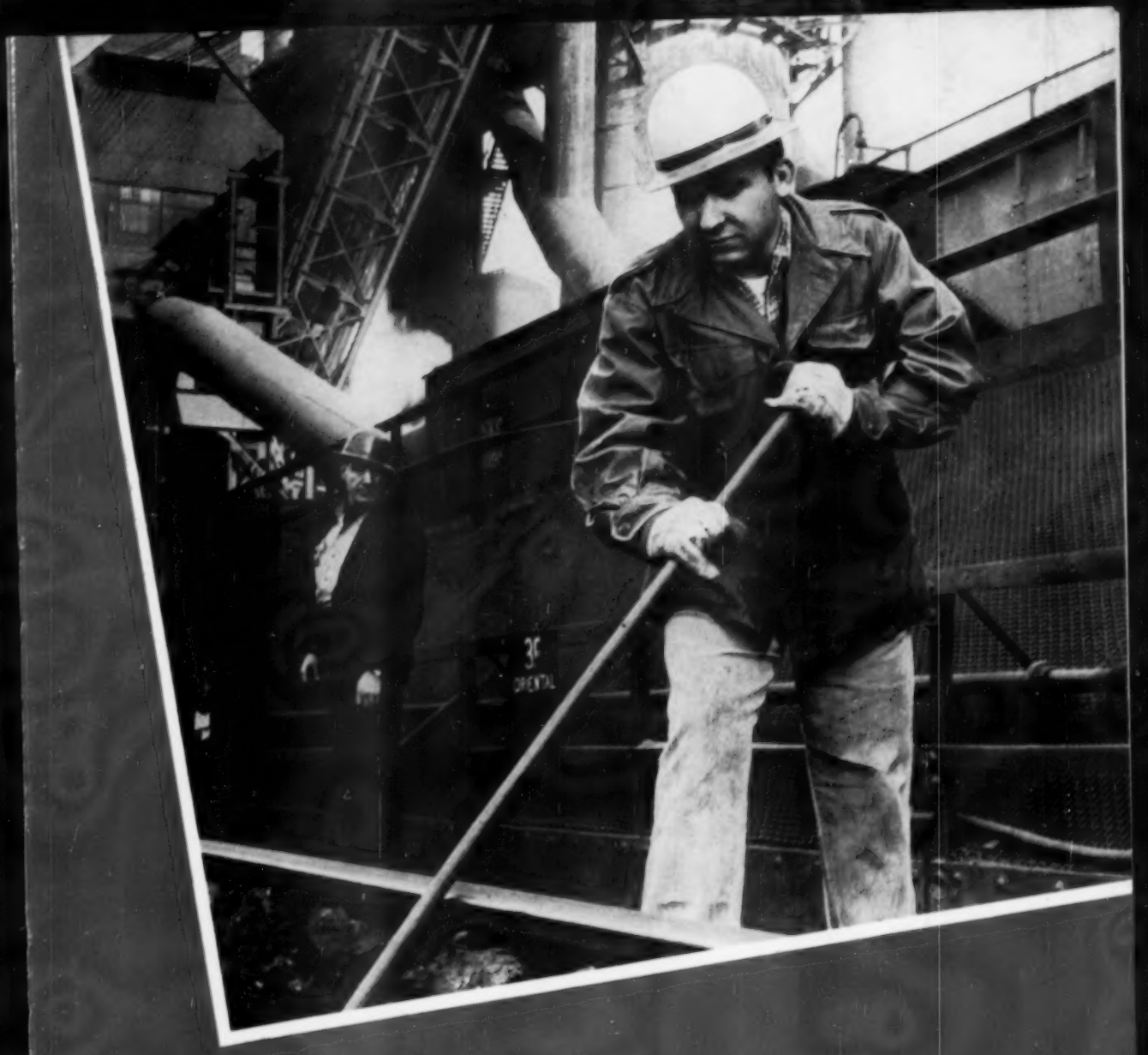

Safety Maintenance and Production

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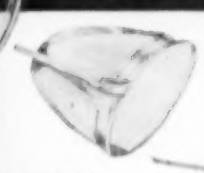

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Published by Alfred M. Best Company, Inc., Publication Office, Columbia Turnpike, Box 232, Rensselaer, N. Y. Editorial and General Offices, Best Building, 75 Fulton St., New York 38, N. Y. Entered as Second Class Matter at Post Office at Rensselaer, N. Y. Under Act of March 3, 1879. Subscription rates, $4.00 Per Year in the United States; $5.00 in Canada; Foreign, $5.00. Single Copies, 50 cents. Publication Date 1st

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Annual Subscription $4 (two years $6)
Canadian & foreign $5 (two years $8)
Single issues 50c. Also quantity rates

Safety Maintenance and Production

formerly "SAFETY ENGINEERING"

Volume 112, Number 1 **July, 1956**

EDITORIALS

Growing Responsibilities 5
Noise Control 5

ACCIDENT PREVENTION

New Quarry Safety Code 9
A Lifting Quiz 12
Safety Equipment for Chemical Maintenance 14
by D. J. BRADY
Safety at the Ripsaw 19
Are Your Employees Falling Down on the Job? 21
by R. L. POTTER (ladder & scaffold series)
Free Safety Bulletins 35
New Safety Products 59

MAINTENANCE

Maintain Chemical Process Equipment Safely 14
by D. J. BRADY
Are Your Employees Falling Down on the Job? 21
by R. L. POTTER (ladder & scaffold series)
Free Maintenance Bulletins 35
New Maintenance Products 59

INDUSTRIAL HYGIENE

Industrial Hygiene News 37
Noise Levels, Actual and Desired 39
by LAYMON N. MILLER
Control of Occupational Dermatitis 45
by DR. ROBERT J. PIERCE (skin protection series)
Keeping Up With Noise Control Developments 48
(industrial noise series)
Free Industrial Hygiene Bulletins 35
New Industrial Hygiene Products 59

FIRE PROTECTION

The Fire Front 27
Combustible Gas Alarm 28
How Electronics Safeguard Combustion 29
by P. K. RYDER
Free Fire Protection Bulletins 35
New Fire Protection Products 59

SPECIAL DEPARTMENTS

Production Aids Check List 6
The Future Shows 8
"Safety Maintenance" Salutes 23
The Safety Shelf 24
Achievements & Awards 25
What's the Law? 32
Free Bulletins & Catalogs 35
Reader's Inquiry Card 35
What's Your Problem? 36
Inside the Trade 58
What's New 59
Index to Advertisers 64
Semi-Annual Index (Vol. 111) 65

Cover picture by courtesy of Mine Safety Appliances Co. (See page 23)

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it's SAFE to say

● GROWING RESPONSIBILITIES

Time was when a safety man concerned himself solely with such physical and tangible hazards as a ladder with a broken rung or an unguarded punch press. Happily those days have receded into the dim past.

As industrial diseases are added to the schedules of Workmen's Compensation laws of practically all the states of the union, top management through its safety activities is obligated to provide protection against the injurious ailments arising from harmful dusts, poisons, fumes and vapors incident to modern industrial processes.

When the Compensation laws were first written the ravages of occupational diseases were not included to offer coverage for the average industrial employee. Through safety engineering revisions, much was accomplished to rid industry of physical hazards which took their toll in eyes, hands and feet. Now, however, threats to industrial health are so widely known that management is thoroughly conversant—or should be—with the extended coverage for industrial diseases.

Just as work accidents lend themselves to control so must the problem of occupational diseases be attacked by those versed in the dangers of harmful gases, vapors, smoke, dust, poisons and infection. It is in this area that those charged with safety responsibility must consider such factors as temperature and humidity, radiant energy, repeated motion, pressure, possibility of shock, tendency toward lung ailments, etc.

The onslaught of occupational disease usually is not sudden. A flying particle striking an unprotected eye can be dramatic and instantaneous. Fumes, attacking the respiratory system, may not demonstrate their danger for a long period of time and often after irreparable damage.

So that prevention and proper protection may be determined through study by those in charge of safety activities, the treatment of existing occupational diseases is in the exclusive province of the medical fraternity. Nevertheless, the ideal point of attack is through the combined contribution of the safety director, the physician, the chemist and the industrial hygienist. The initial challenge, naturally, confronts top management.

● NOISE CONTROL

It is now recognized that excessive or continuous noise in industry not only shatters the nerves but can predispose industrial employees to very serious accidents.

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Nerve-shattering noise can affect the hearing ability of those exposed to this danger and a campaign of noise abatement in industry will prevent our citizens from becoming a nation of nervous wrecks. Where noise control is not feasible, then certainly protective devices should be mandatory. H.A.

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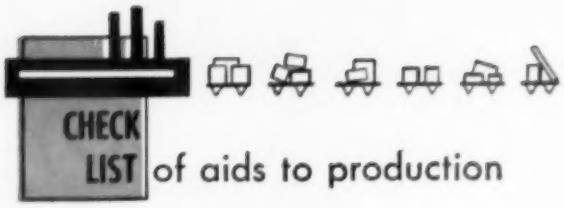


# of aids to production

Through Safety—

Quarry Safety Equipment ... 9
Safe Lifting Methods ... 12
Maintenance Safety Equipment ... 14
Safe Woodworking Machine ... 19
Safe Scaffolding ... 21
Colored Hard Hats ... 23
Acrilan Work Clothes ... 59
Non-Slip Gloves ... 59
Trailer Coupling Lock ... 59
Laboratory Blast Burner ... 60
Life Preserver ... 60
Vehicle Steering Aid ... 60
Force Gauge ... 61
New Glove Line ... 61
Safety Spectacles ... 61
Drum Upender ... 62

Through Maintenance—

Chemical Maintenance Equipment ... 14
Safe Work Platforms ... 21
Removable Marking Paint ... 61
Portable Cooling Unit ... 62
New Vacuum Line ... 62
Reflecting Paint Kit ... 62
Pressurized Graphite Lubricant ... 63
Heavy Duty Exhausters ... 63

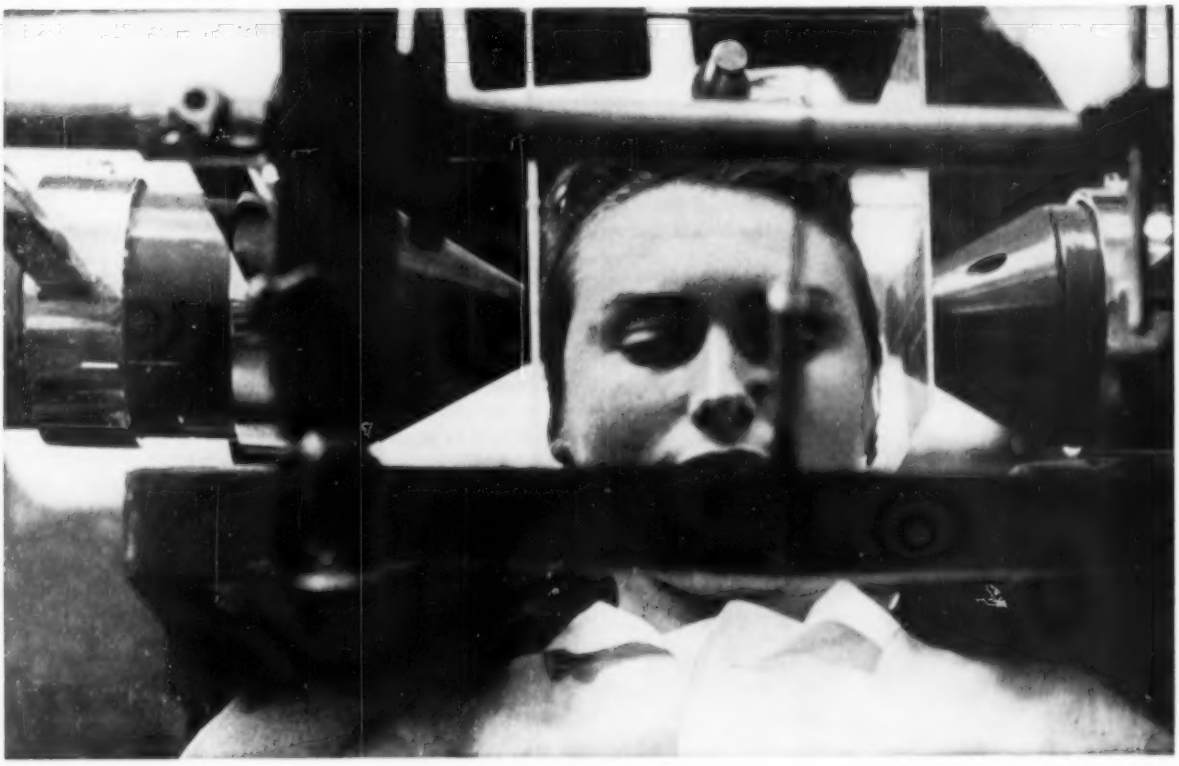
Through Industrial Hygiene

Quarry Sanitation ... 11
Noise Measurements ... 38
Dermatitis Protection ... 45
Jet Silencing System ... 48
Sound & Vibration Analyzer ... 48
Vibration Hangers ... 49
Sound Level Meter ... 49
Hearing Aid Glasses ... 49
Vibration Isolator ... 50
Impact Noise Analyzer ... 50
Ear Protectors ... 51
Air Conditioning Silencer ... 51
Acoustical Baffles ... 51
Sound Proof Room ... 52
Sound Meter & Analyzer ... 52
Vibration Monitor ... 53
Air Exhaust Muffler ... 53
Vibration Mountings ... 54
Flexible Ear Plug ... 54
Adjustable Machine Mount ... 55
Paper Cup Dispensers ... 57
Dermatitis Skin Cream ... 59
Air Sampler ... 60
Portable Fume Collector ... 61
Medication Applicator Bottle ... 61
Vitamin Capsules ... 62
Non-Adherent Dressing ... 62
Dust Collector Silencer ... 63
Exhausters ... 63

Through Fire Protection—

Quarry Fire Equipment ... 10
Combustible Gas Alarm ... 28
Electronic Burner Safeguards ... 29
Automatic Alarm System ... 63

THE NEXT MEDICAL MILESTONE . . . CONQUEST OF CANCER?



In a few short years we've seen the discovery of antibiotics, new wonder drugs for tuberculosis, a vaccine for polio. We will see the conquest of cancer, too, if people want it badly enough. Last year the American Cancer Society was unable to fill requests for research funds totalling almost $3,000,000. The reason—not enough money. Did you give all you could? Will you give all you can?

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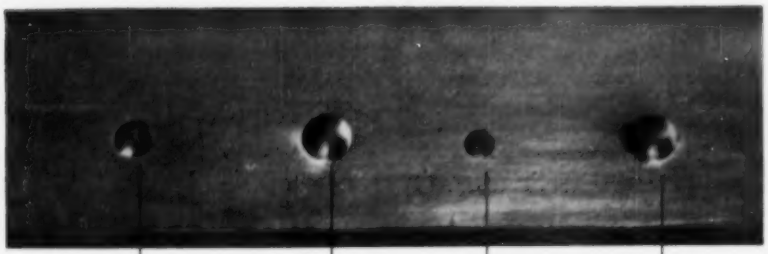

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MARKS OF A KILLER!

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Can you read the marks of potentially killing blows from a five pound ball dropped 8 feet on the crowns of aluminum safety hats? The depth of the dents on this aluminum bar indicates how much actual impact the wearer would feel on his head. See how deeply blows on competitive hats A, B and C mark the metal. Yet, the BULLARD aluminum hat hardly shows a mark. This is because BULLARD'S exclusive full floating headband distributes and absorbs the blow, taking the danger out of the impact. This, coupled with the girder-like strength of the BULLARD three-ribbed crown provides the greatest protection possible in aluminum hats and caps. **COMFORT**—They are just as light as your old felt hat. The cap weighs only 10 ounces. And with BULLARD'S exclusive universal headband you're always assured of a perfect fit. **COLOR**—Now you can have a choice of permanent non-fading colors in aluminum hats—yellow-gold, blue, grey, green, bronze and silver. Colors to identify trade or company.

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the future shows

York Harbor, Me. *September 13–14*

Twenty-Ninth Annual Maine State Safety Conference (Marshall House). Arthur F. Minchin, Secretary, Department of Labor & Industry, State House, Augusta, Me.

New York, N. Y. *Oct. 14–16*

First International Sanitation Maintenance Show & Conference (New York Coliseum). William S. Orkin, managing director, Orkin Exposition Management, 19 W. 44th St., New York, N. Y.

Chicago, Ill. *October 22–26*

Forty-Fourth National Safety Congress and Exposition (Conrad Hilton Hotel). R. L. Forney, Secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Columbia, S. C. *November 8–9*

Nineteenth Annual South Carolina Accident-Prevention Conference (Jefferson Hotel). J. D. Watson, Jr., Safety Engineer, South Carolina Industrial Commission, Columbia, S. C.

Atlantic City, N. J. *November 12–16*

Eighty-Fourth Annual Meeting of the American Public Health Association (Convention Hall). Information: American Public Health Association, 1790 Broadway, New York, N. Y.

Fort Wayne, Ind. *March 19–20*

Fourteenth Annual Northeastern Indiana Safety Conference and Exposition (Chamber of Commerce Building). Ivan A. Martin, manager, Safety Council, Ft. Wayne Chamber of Commerce, Ft. Wayne 2, Ind.

New Quarry Safety Code

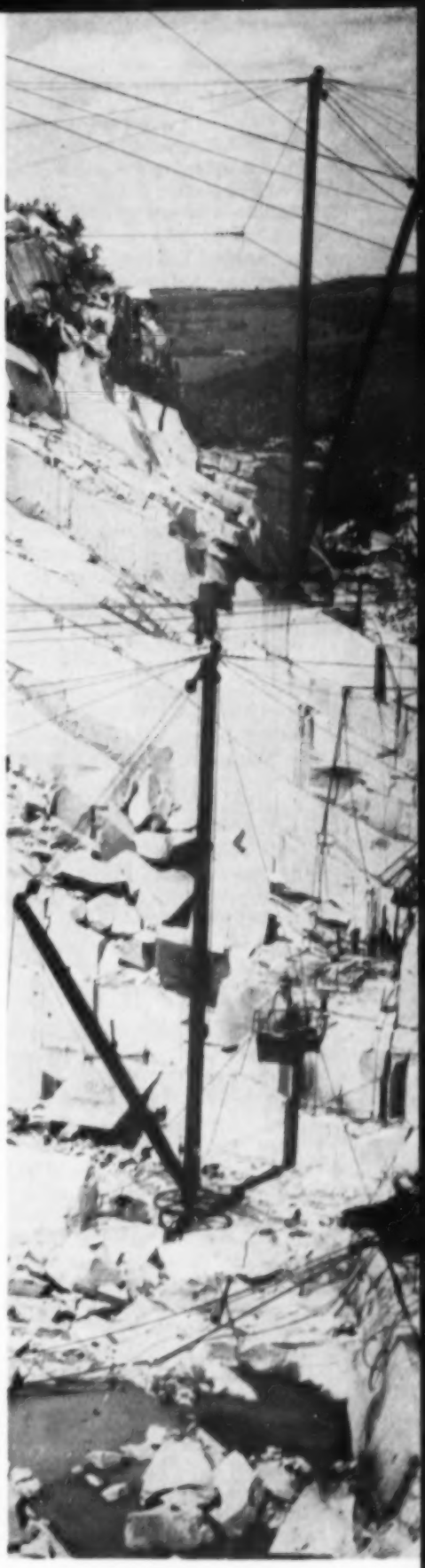
A new American Standard or Safety Procedures for Quarries has been released, according to an announcement by Vice Admiral George F. Hussey, Jr., USN (ret.) managing director, American Standards Association.

"Even if this standard had never been finished," Daniel Harrington, former chief of the Health and Safety Service of the U. S. Bureau of Mines and retired chairman of the Mining Standards Board of ASA, said, "it would have done incalculable good in the forwarding of safety in the quarry industry."

"In the approximately 15 years the project was under way, hundreds of persons in the industry were forced to give time and intense consideration to matters pertaining to safety that would never have been taken up if the strife brought out by the project had not occurred, and hundreds of executives now have a clearer conception of quarry safety," Mr. Harrington added.

Mr. Harrington, who was chairman of the committee which developed the standard until his retirement in 1948, told how provisions were submitted, revised and submitted again during the long period the code was under development. When a provision was rejected, however, it was usually one which had been tried in a quarry for actual observance by committee members.

It would often develop, he pointed out, that a procedure successful and safe in many quarries would be ill-fitting and even hazardous in others due to climatic conditions, rock structures and



PERSONAL PROTECTIVE EQUIPMENT

(Editor's Note: The section of the new quarry safety code dealing with Personal Protective Equipment is reproduced herewith.)

- **The following types of personal protective equipment shall be made available to employees either through company facilities or by arrangements with sources convenient for employees:**
  - **Eye protection equipment, such as eye shields and goggles**
  - **Respirators**
  - **Safety belts and lifelines**
  - **Rubber gloves and other rubber protective equipment for electricians**
  - **Welders' helmets**
  - **Safety shoes**
  - **Hard hats as required particularly by the hazard of rock falling from the face**
  - **Salt tablets during the summer months**
- **The company should maintain personal protective equipment supplied by them in safe and healthful condition by making arrangements for sterilizing respirators and other equipment as required, and replacing and repairing worn parts.**

other special features. Then a provision had to be overhauled with allowance for certain phenomena, or often a trimming job had to be done so that no free interpretations or possible misreadings could occur.

The National Safety Council furnished administrative leadership as sponsor of Sectional Committee M28. W. P. Leake, Louisville Cement Corporation, a representative of the National Safety Council, succeeded Mr. Harrington as committee chairman.

The new American Standard is designed to eliminate frequent and serious hazards in quarrying. (This covers all "open face" pits from which stone, sand, gravel, or other materials are taken.) The precautions recommended apply for the most part to stone "mining" operations as well as quarrying.

The committee based its work on the National Safety Council's publication entitled "Safety in Quarry Industries," used for many years in the industry. But the committee goes much further in its recommendations, especially on procedures dealing with explosives and the operation of trucks and other quarry equipment.

Explosives Section

The 216 recommendations on explosives contained in the code were developed and submitted to the committee by the Institute of Makers of Explosives. Of these, 50 articles deal with the safe storage of explosives—in "permanent magazines which are theft-resistant, fire resistant and bullet resistant."

In case of a scheduled plant shut down, one article recommends special precautions for the removal of all explosives including detonators from company property, and provides that additional locks be placed on magazines with the keys held in the custody of a responsible person.

The section on explosives also says that the roofs of magazines located where it is possible to fire bullets through the roof into the explosives must be bullet-proof. A condensation of the American Table of Distances issued by the Institute is included. Safe distances from inhabited buildings, passenger railways and public highways, at which explosives may be stored, are specified.

The entire section on explosives makes recommendations concerning handling, transportation, and the use of safety fuses and caps. Safeguards are set up for all types of blasting used in quarrying. Cautions are given for large diameter drill hole blasting, for toe hole or snake hole blasting, wagon drill hole blasting and tunnel or coyote hole blasting.

Instructions Included

Special instructions on safe electric blasting are included. As electric blasting in close proximity to radio stations is dangerous, the code says if you want to blast within one mile of a permanent broadcasting station, you'd better consult the manufacturer of the blasting caps first! The code further warns against using portable radio phones and transmitters within a 100 feet of where electric blasting caps are being used.

Trucks and automotive equipment, next to explosives, were given the most consideration by the document. Attention was given to all factors in equipment checking, driving hazards, dangers of overloading, proper use of a power shovel, horn signaling and the overall condition of trucks used in quarrying.

When hoisting and lowering men in cars on slopes and inclines, the code provides that a special device be installed to insure against accident should the drawbar, coupling, or rope of any car break or become detached.

FIRE PREVENTION

(Editor's Note: The section of the new quarry safety code dealing with Fire Prevention is reproduced herewith.)

- **Buildings should be constructed in conformity with the standards of the National Fire Protection Association.**
- **Exit doors should be hung so as to swing outward for safe egress in case of emergency.**
- **Exit doors should remain unlocked during working hours.**
- **Flammable liquids, such as oils, greases, gasoline, and similar materials should be stored in separate buildings of incombustible construction situated at least 100 feet from other plant buildings.**
- **Tight metal receptacles should be provided for oily waste and rags.**
- **The use of lead-proof oil valves is recommended. Drip pans should be provided to catch spilled oil; these should be kept clean.**
- **Gasoline should be stored in underground tanks when practicable.**
- **Storerooms and warehouses should be kept free of rubbish and flammable packing.**
- **Smoking should be prohibited in all buildings in which flammable liquids are stored or dispensed.**
- **Fire extinguishers should be kept in good condition, protected from freezing, and serviced at regular intervals.**
- **The distribution, inspection, and maintenance of fire extinguishers should be in accordance with the recommendations in the fire extinguisher chart.**
- **All stationary or portable fire-fighting devices and apparatus should be inspected frequently to insure their good working order at all times.**
- **Written reports of all fire inspections, showing the condition of all fire-fighting equipment, should be made and kept on file. Inspections should be made monthly.**
- **A fire-fighting organization should be maintained and practice drills held at regular intervals. It is recommended that practice drills be held at least every three months.**
- **Each employee in each department of a plant should be thoroughly instructed regarding the fighting of fire in that department. This is in addition to the regular fire-fighting organization.**

For the general health and convenience of employees, the code outlines certain practices for housekeeping, toilet facilities and drinking fountains. Change houses where employees may bathe and dress at the end of the shift are recommended.

Employees must also be provided with personal safety equipment such as eye shields and goggles, respirators, safety belts and lifelines and hard hats. During the summer months employers must keep salt tablets available for workers.

An appendix in the publication gives information on establishing and using first-aid and medical facilities and advice on investigating accidents and preparing reports and records on them. The appendix also contains hints on how to make the best use of the procedures outlined in the American Standard.

Includes 14 Divisions

The entire American Standard Safety Procedures for Quarries is made up of fourteen divisions: Scope; Definitions of Terms; Personal Protective Equipment; Physical Conditions of Quarries and Pits; Drilling; Explosives; Transportation; Loading, Conveying and Other Equipment; Electrical Equipment; Structures, Walkways and Working Services; Hand Tools; Welding; Fire Prevention and Sanitation.

The following organizations had representatives on the committee on Safety Procedures for Quarries: Association of Casualty and Surety Companies, Gypsum Association, Institute of Makers of Explosives, International Association of Governmental Labor Officials, National Association of Mutual Casualty Companies, National Crushed Stone Association, Inc., National Electrical Manufacturers Association, National Lime Association, National Safety Council, National Sand and Gravel Association, U. S. Department of Interior—Bureau of Mines, U. S. Department of Labor—Bureau of Labor Standards.

This American Standard, M28.1–1955, is available from the American Standards Association, 70 East 45 Street, New York 17, N. Y., at $1.50 a copy.

SANITATION

(Editor's Note: The section of the new quarry safety code dealing with Sanitation is reproduced herewith.)

Sanitation facilities shall comply with the requirements of the health authorities having jurisdiction.

HOUSEKEEPING:

- **Receptacles for waste and refuse should be provided at convenient locations; where wastes may be liquid, the receptacles should be of a type that does not leak and the receptacles should be kept sanitary.**
- **Rubbish, scrap, and packing materials should be removed periodically from buildings and yards.**
- **Aisles and passageways should be kept clean and free of materials, containers, and other obstructions, and aisle limits should be plainly marked.**
- **Floors and other walkway surfaces should be kept in good repair and free from accumulations of oil, grease, water, and other materials.**
- **Dangerous projections into walkways should be eliminated whenever practicable.**
- **Materials near roadways or walkways should be piled in an orderly manner.**

DRINKING WATER:

- **Employers shall furnish adequate supplies of pure drinking water for use of all employees at the quarry and at the plant.**
- **Drinking water shall be from a source approved by local or state health authorities.**
- **Sanitary drinking fountains should be of a type approved by health authorities and in accordance with the American Standard Specifications for Drinking Fountains Z4.2–1942, or the latest revision thereof approved by the American Standards Association, Incorporated.**
- **Open containers, whether fitted with a cover or not, shall not be used.**
- **Drinking water should be protected against contamination at all times and sources of water unfit for drinking shall be so posted.**

CHANGE-HOUSES:

- **A suitable change-house where employees may bathe and change clothes at the end of the shift is recommended.**
- **Change-houses should be constructed of fire-resistant materials.**
- **A change-house should be adequately lighted and heated and have a sufficient quantity of hot and cold water for all employees.**
- **Individual towels of cloth or paper should be provided together with receptacles for disposing of used towels.**
- **One lavatory should be provided for each 10 employees or the equivalent of 24 inches of a sink with individual faucets.**
- **Change-houses should be kept clean and well ventilated.**

TOILET FACILITIES:

- **Each quarry should be provided with a sufficient number of tightly constructed, and insect and rodent-proof closets approved by health authorities.**
- **Adequate "dry" closets should be provided where suitable pits cannot be conveniently made, such as on a solid rock-quarry floor.**
- **Proper arrangements should be made for the effectual cleaning of all "dry" closets and for the use of a disinfectant or deodorizer. The use of quicklime is recommended.**
- **Care should be taken that excrement in dug closets will not contaminate the drinking water.**
- **Employees should be required to use the toilet provided for their convenience, and they should be penalized for defecating on the surface, especially on the quarry or pit floor.**

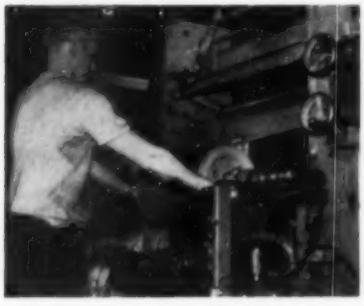
A Lifting Quiz . . . Do

↑1A 1B↓

↑2A 2B↓

You Know the Answers?

↑3A



3B↓

↑4A

4B↓

↑5A

5B↓

Which is the right way, the unsafe way?

The Safety Department and the Employee Relations Division of the Standard Register Company cooperated in showing employees the right and wrong ways of lifting and handling materials by running a picture quiz in the company house-organ, "Stan-Record Graphic." The pictures reproduced here, were taken in various parts of the Dayton, Ohio, plant. Two pictures were taken of each lifting problem, one illustrating an unsafe method and the other the correct way.

How is your own lifting IQ? The correct answers are given on page 22.

↑6A

6B↓

Maintain Chemical Process

by **D. J. BRADY**
Safety Department
Dow Chemical Co.
Midland, Michigan

Safe maintenance of chemical equipment is of prime importance to the operation of a chemical plant. It is during maintenance work involving welding and vessel entry that the greatest hazard to life and property exists. These inherent hazards can be overcome through the wholehearted cooperation of production, maintenance and safety departments.

Maintenance work requiring such cooperation falls roughly into two categories, Hot Work and Vessel Entry. Some representative examples are:

HOT WORK
Welding
Lead burning
Drilling
Concrete busting
Glass lining repair
VESSEL ENTRY
Tank cleaning
Pump repairs
Agitator repair
Lining inspection

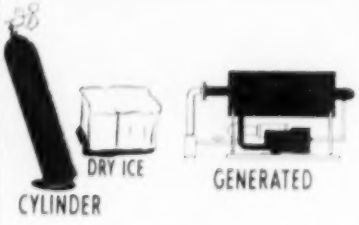
In many cases the two categories overlap as in the case of welding inside of tanks, and glass or lead lining repair.

To aid in the preparation of equipment for maintenance work, numerous useful devices are available. Some of the most often used are shown in the accompanying chart of "Safety Equipment for Chemical Maintenance."

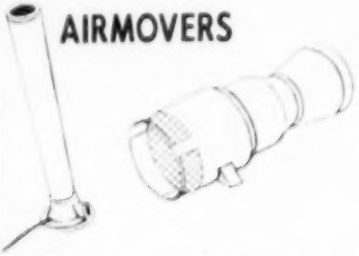
The job of preparing equipment for maintenance would be quite haphazard if some written record of what has been done were not used. We find that the most important step in making maintenance work safer is the proper use of Vessel Entry and Hot Work Permits. On this permit all the precau-

(Continued on page 16)

Safety Equipment for Chemical Maintenance



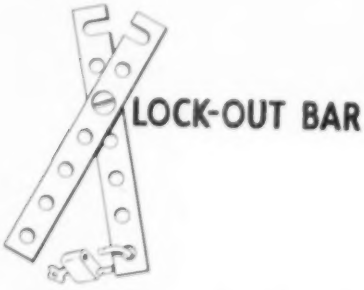
Inert gas supply may be any inert gas of your choice. It might be in cylinders, generated in the building or in the case of CO_2 might be a solid. It is used to purge low flash point materials safely.



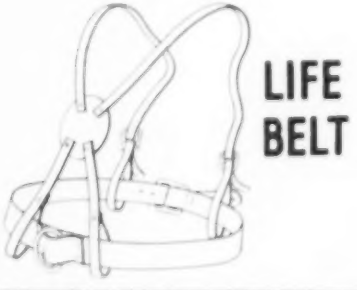
There are several types of **air-movers.** Some are electric powered, others steam or air powered. Air-movers properly grounded are used to remove vapors from vessels prior to maintenance work and to insure a fresh atmosphere while that work is in progress.

Blanks are generally frying pan shaped pieces of metal of various sizes and thicknesses used to seal off lines leading to the equipment being worked on.

Switch lockout bars are simple devices, but are very important in the preparation of vessels for vessel entry and pump lockout in lieu of blanking.



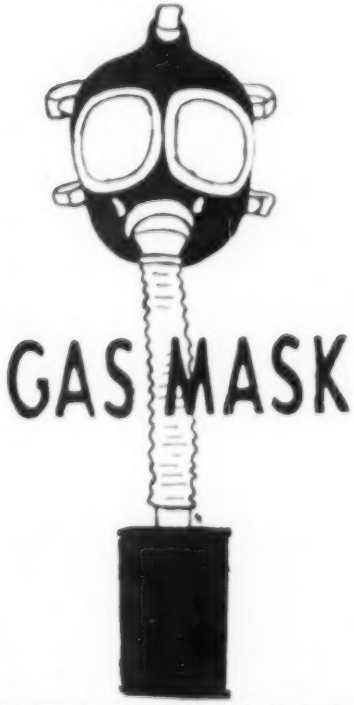
Safety belts or life belts are strong leather or webbing harnesses which fit under a man's arms around his chest. They enable fellow workmen to remove him from a vessel if the need arises by pulling on the rope attached to the back of the safety harness.



Equipment Safely

Explosimeters are explosion-proof hot wire type instruments designed to give percentage readings of the lower explosive limit of the combustible for which they are calibrated.

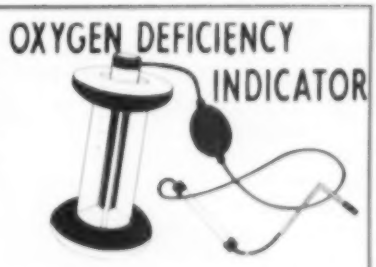
Gas masks provide full face protection and respiratory protection as long as the concentration does not exceed cartridge capacity and the oxygen content of the contaminated atmosphere is maintained above 16%.



The blower mask is a power driven or hand operated fresh air supply to be used with a full face air mask. Two masks may be supplied from one unit. They are essential for work in vessels when it is impossible to remove toxic vapors completely before entry.

Rubber suits, rubber gloves, rubbers, face shields, goggles, and respirators also come into use on many occasions.

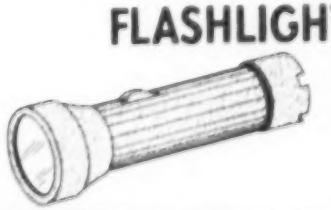
An often overlooked aid is a **handbook** containing the explosive limits of most chemicals, their flash point, solubility in water, ignition temperature, and best extinguishing agent.



An **oxygen deficiency indicator** comes in handy if means of supplying fresh air to the equipment is not available or if inert gas has been used to purge and you wish to know if sufficient fresh air has been introduced prior to entry.

Water, air, and steam supplies are helpful allies in preparing vessels.

An **explosion-proof flashlight** is indispensable in checking for residue, improperly cleaned equipment or small drips of corrosive material from recently blanked lines.



Process Equipment
(from page 14)

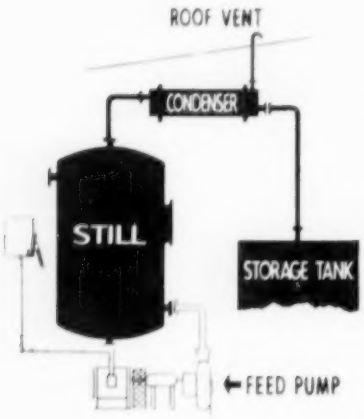
tions already taken are noted by check mark in the proper square, and the special precautions to be used while the work is in progress clearly detailed. Authorization by supervision requesting the work and maintenance worker's acknowledgment of the safe procedures to be followed are confirmed by signature on the permit. Where a Safety Department representative's assistance is requested, he also signs the permit.

Now, to put these devices to work, let's take a few typical chemical plant maintenance operations.

WORK PERMIT

Hot Work Permit

Example of Hot Work Maintenance



This job is a welding operation on a still which has developed a leak in the manhole neck near the shell of the still. Replacement of the neck is necessary. (See illustration.)

First step in the safe preparation of the vessel is to determine the flash point of the material in the still, its water solubility and toxicity. The handbook previously mentioned helps with this detail. It is found that in this case the material has a flash point of 135°F., is only slightly soluble in water, and is highly toxic.

Armed with this knowledge, we can now go to work on the still. We lock out the feed pump; drain and blank the feed line at the still; blank the condenser discharge to storage tank; open the line from the condenser to roof vent. The still and condenser are now filled with water and boiled for 36 to to 48 hours. Noting the flash point of the material, 135°F., it would seem the still should now be clean. Boiling is stopped; the still drained and checked with an explosimeter at the top of the condenser and through drain-out valve in the bottom. This must be done while the temperature of the still is above the flash point of the material; otherwise an explosimeter check would be of no value. If zero readings are obtained, the manhole is pulled and the walls of the still inspected with flashlight for scale. The approximately 6000°F. heat of a burning torch will drive off a lot of vapor if residue retaining scale is present.

If the still is comparatively free of scale, it is filled with water to within six inches of the manhole, and we turn our attention to the hazards of nearby areas. An open gutter runs behind the still. It is checked with an explosimeter for flammable vapors and if clear, a water hose is placed in it upstream from the still to assure that the sump trap remains full of water during welding operation. Nearby equipment is checked with an explosimeter for possible vapor leakage. Particular attention is given to all equipment within the range of burning sparks to make sure all is buttoned up so as to exclude sparks.

If the area checks okay, fire protection is our next thought. In all cases involving welding, some type of fire protection must be on the job. The handbook tells us the most suitable extinguisher to use for the material present in adjacent equipment, so this type is procured and responsibility for fire watching is delegated. Fire watch in our plant runs from one man, preferably a building employee with water hose or hand extinguisher, to four or five firemen with a fire truck.

With fire protection adequate, we now can make out the Hot Work Permit. The first question asks if lines leading to or from equipment have been disconnected or blanked. In reviewing our preparation, we find that we have blanked the feed line to the still and the line from the condenser to the storage tank; so we put a check opposite flammable materials.

The next section, concerning valves, does not apply in this case, so we move to the third section. This asks what has been done to the equipment, and we know that it was steamed and washed. Section four, the feed pump was locked out. Next, section five, concerning protective equipment: first, goggles—it is quite important to check the welder's helper, for the welder is well equipped but often the man who is going to hold the work while the welder tacks it has nothing to protect against the arc except plain glasses. Dark glasses are obtained, and we come to respiratory protection. Respiratory protection is unnecessary in this case. Protective clothing is unnecessary. Ventilation: here we pause to consider; perhaps an air-mover placed at the condenser would keep any fumes generated by the burning operation out of the welder's face, so we add ventilation to the list.

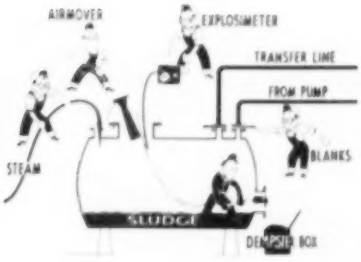
Under fire protection, we have a building employee with the proper extinguisher; so we check that and

go to No. 6. Has equipment been checked for residuals? Yes, it was checked with both explosimeter and visually; so we check flammable materials and move to No. 7.

Have hazards of nearby areas, including sewers and gutters, been considered? As you recall, we checked the gutter behind the still and nearby equipment; so we place a check mark in seven and move to No. 8. In this case, an operating representative will be standing fire watch; so we check this square, sign it at the bottom, review the job with the men doing it, obtain their crew-leader's signature, and we're ready to work safely.

A further word on one phase of the preparation: the checking with an explosimeter. As you noticed, a check was made while the still was hot. Now, due to having steam vapors coming from the tank, if sampling is done over too long a period, condensation in the meter system will both foul up your meter and give you an improper reading. Due to the high flash point of the material, it was necessary to check a steamy atmosphere and tests have proven that a reading will be obtained if flammable vapor is present before condensation occurs in the meter if the tests are of short duration.

Example of Vessel Entry Maintenance



The second maintenance job I would like to review is one involving vessel entry. This tank is approximately 10' x 40', is outside, and has contained a hydrocarbon that leaves a sludge which must be cleaned out periodically. The projected job is this semiannual cleanout.

Investigation of the characteristics of the material shows a flash point of 82° F., a boiling point of 152° F. and the material is toxic to breathe or contact.

First, we blank transfer line and equalizing line, then ventilate with bonded airmover for one hour through manhole whose cover was removed by a gas mask equipped maintenance man. Tank is then steamed for forty-eight hours through a grounded steam hose. Steaming is stopped and tank checked with an explosimeter. If readings are 20 percent of the lower explosive limit or below, the bottom manhole is removed and a Dempster box placed beneath it, for in this case the sludge is to be carted to the refuse burner for disposal. The airmover is replaced in the top manhole, and we turn our attention to the men who are to clean the tank.

The toxicity of the material remaining in the sludge requires both respiratory and skin protection; so rubber suits, gloves, and boots will protect the skin and blower mask will be used to guard against fume inhalation as the sludge is removed. Gas masks are considered inadequate for this job

because, as the sludge is removed, the vapor concentration might exceed cartridge capacity even with the airmover blowing in the top manhole. Safety belt and rope complete the man's preparation, so hazards of nearby areas are investigated. Because this tank is outside with only storage tanks for company, with no equipment above or below the tank to be worked on, the area is considered okay. As in the case of the welding operation, a Work Permit is executed.

Work Permit

We find under number one that lines conveying flammable material to and from the tank have been blanked; vessel has been steamed and purged with air; respiratory protection has been provided by the blower mask; protective clothing consisting of rubber suits, boots, and gloves is to be used; tank has been checked for flammable vapors; and hazards of nearby areas have been considered. In addition to the check list, instructions on job procedure are noted elsewhere on the permit. They are: two men at the manhole at all times, rubber suits, gloves, boots, airmovers, safety belt, and blower. The supervisor signs the permit, the job is reviewed with the men doing the work, and their crew leader signs the permit. This completes the job preparation.

The Work Permit properly executed leaves no doubt as to the procedures to be used in carrying out the work. I'd like to make a few remarks concerning changes necessary if the flash point of the material were to be, say 10° F. In that case, a check with an explosimeter at frequent intervals would be required to see that the concentration of vapor did not exceed 20 percent of the lower explosive limit, a figure considered maximum allowable concentration for men to work in, even blower mask equipped. Another concerns the amount of air introduced with an airmover. Enough air to change the atmosphere in the tank at least every three minutes should be a minimum amount. One type of airmover we use has a rating of 3500 cu. ft. per minute at 90 lbs. air pressure. Another size moves 1500 cu. ft. at the same pressure, so care must be exercised to use the size airmover that will give proper ventilation.

Although safe preparation of vessels has to be governed by flexi-

ble rules because of the wide variation in characteristics of chemicals, there are certain axioms used at our plant. They are:

1. Never trust a valve; disconnect or blank the line.

2. Lock out switches on pumps and agitators; don't just pull the switch. Remember to try the starter button after you lock out the switch to assure that the right switch has been locked out. Never pull knife-type switches while motor is under load on equipment using more than 110 volts.

3. Insist on fire protection of some type regardless of where the welding is to take place.

4. Always air dry a vessel that has contained a corrosive or toxic material. Even though thoroughly washed, a dry tank lessens chance of skin contact.

5. Ground all steam hoses and airmovers when purging flammable materials.

6. On low flash point material, use air in preference to steam to vapor free the tanks—it cuts down the electrostatic hazard.

7. When entering tanks that have contained toxic material, use the same precaution in regard to clothing and breathing as if the tank hadn't been cleaned.

8. Never weld on a completely closed vessel. Make as many openings as possible.

9. Eject fumes when welding in lead lined or nickel alloy tanks. The fumes are toxic.

10. Do not weld in hazardous areas if other methods will serve as well. Many times equipment, particularly piping, can be disconnected and moved to a non-hazardous location.

11. Always keep a welder under observation when he is on a hazardous job. With his shield down, a welder is blind to everything but his arc.

12. Do not depend on sense of smell to determine vapor or gas concentration in air. Check with instruments.

13. When in an operating area, never enter a vessel over four feet in depth where entry is made through a manhole without a man at the opening and another within call. 95 percent of the time a safety belt is required.

14. Make sure when using blower mask that the air intake is in an uncontaminated atmosphere. Place box upwind from tank being cleaned.

15. Check all valve boxes and manholes for gas and oxygen deficiency before entry.

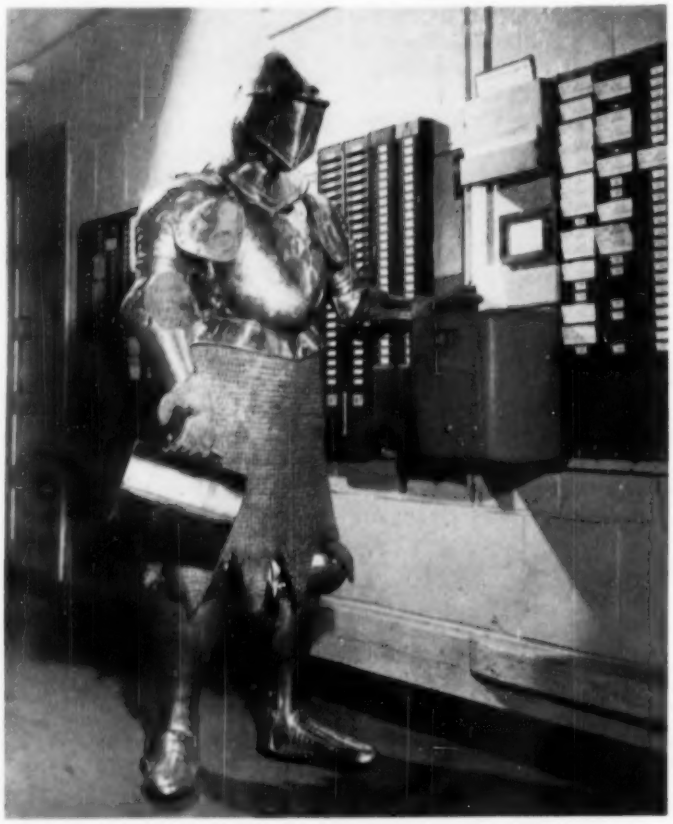
16. Never cut into a lap patch on a tank without drilling several holes and checking for chemical trapped behind it. We are working toward the elimination of all lap patch jobs at our plant. Replacement of a section of tank will remove all hazards of entrapped chemical when future maintenance jobs are necessary. Lead lining repair falls into the same category as patches. If blisters are present, open them up before burning.

17. Require a Vessel Entry sheet for all tank entry jobs where the tank is over four feet in depth. A hot sheet in all hazardous areas should be required.

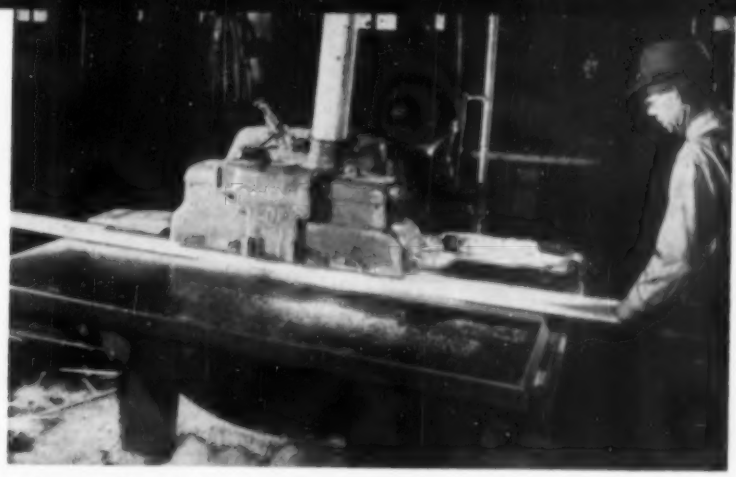
18. Don't burn on rubber-lined equipment; remove rubber for at least twelve inches around the area to be worked on.

There are many more safety precautions that don't quite fall into the category of axioms that we use as standard practice in the preparation of equipment for maintenance. In all honesty, many of our present axioms were formulated after adverse experiences.

From an address presented at the 43rd National Safety Congress.



KNIGHT SHIFT?—No, just one man's idea of how not to get hurt on the job! He recently clanked through Minneapolis-Honeywell's plants in an attention-getting dramatization of National Job Safety Week. Actually, the firm's employees were not conspicuously in need of this jangling reminder, having recently received their 14th straight safety award presented by the Governor of Minnesota.



In this view of a straight-edging ripsaw in operation, note the grilled guard which runs from the topworks out over the lumber at the left hand or outfeed end for full safety.

Safety at the Ripsaw

Ripsaws have always been notably dangerous machines specifically in reference to kicking back. Kick-back accidents still occur on some types of ripsaws where the operator does not fully understand the machine. A kick-back occurs when material comes into contact with the rearward or ascending teeth of a circular saw blade, or (as occasionally happens at a handfeed ripsaw) when a piece of material chances to be dropped directly on top of the running blade.

Guard for Handfeed

Kick-backs are always far more serious where there is no guard of any kind over the blade. Therefore, if one must use a handfeed machine, it is always wise to keep a guard over the blade if at all possible. True, there is an occasional type of work where it is difficult to use a guard to any advantage and in some cases it is impossible to do a given type of work while using a guard. Wherever a guard is used on a handfeed machine, it should be set down as close to material being ripped as consistently possible.

The real solution to elimination of the kick-back, however, is use of a modern straightedging ripsaw, incorporating a set of pressure rolls which automatically feed material through the saw, once they have engaged it. The primary function of these pressure rolls is to feed material absolutely straight, so the saw will cut a straight line. However, it so happens that the design of the machine makes this a far safer process. It greatly lessens any danger of kick-back because of the closeness with which the pressure rolls and the chain confine the material passing through.

In the case of an overcutting type straightedging ripsaw, there is no opening between two chains running in the table, for the simple reason that only a single chain is used. Tips of the teeth of the overcutting saw run in a groove in that chain. Consequently, any piece of offal removed from a short piece of stock going through is automatically carried to the back of the machine, where it has no opportunity to come into contact with the teeth and be thrown toward the operator.

Regardless of the inherent safety of the machine from the standpoint cited, a set of narrow steel fingers is incorporated, which drop down close on top of the running chain as soon as the last end of a piece of short stock has passed them, thereby making it impossible for any slivers to be thrown back.

It is obvious that on a machine of this type, it is absolutely unnecessary for any operator to get his fingers anywhere near the running saw blade at any time. In fact, the design of the machine is such that it is not possible for him to do so. A grilled metal guard extends out over the feed chain at the rear, so the offbearer cannot come in contact with the chain in the rear table.

Also, immediately behind the running chain, at the table outfeed, there is a swinging rear guard. The swinging action prevents edgings from wedging between the chain and the guard, to cause any damage. Whenever an edging fouls at this point, the guard simply swings back and allows it to fall through, then automatically returns to position.

Pinched Pieces

Kick-back is sometimes caused at a handfeed ripsaw by a piece of short lumber violently and suddenly pinching on the saw blade while being run through, due to a severe internal stress in the lumber. This cannot happen, obviously, at a straightedging saw. Neither can portions of severed knots be thrown back, for the steel kickback fingers referred to hug the top surface of lumber being ripped, and effectively block any flying knot fragments from passing them.

Picture by courtesy of Mattison Machine Works.

Highway Murder

American motorists are heading for the worst year of traffic deaths in history, President Eisenhower's spokesman told the midwest regional conference of the President's Committee for Traffic Safety recently.

The warning came from Howard Pyle, former Governor of Arizona, who represented the White House at the conference and is now Deputy Assistant to President Eisenhower.

Reminding some 1,600 participants from fourteen midwestern states that 38,300 Americans died in traffic last year, and that deaths have mounted every month for thirteen consecutive months, Governor Plye said:

"The people of the United States could cut traffic deaths in half in six months if they really wanted to do it.

"You people right here are the ones who can supply the leadership to get it done. You were handpicked as the persons from your areas who would most likely succeed in leading your fellow-citizens in developing the solution to this tragic problem.

The answer to the traffic problem, Governor Plye said, lies in the "Action Program;" the designation for the safety measures worked out over the years by traffic experts, and endorsed by the President's Committee and major safety organizations. He commented:

"More than a hundred people are dying every day in the United States in what we call traffic "accidents." That is more than one man, woman or child sacrifice—needlessly—every fifteen minutes. And, the death rate is still going up! If we keep up what we've been doing so far in 1956, we are going to kill more people on our streets and highways than we have ever killed before. Our worst year so far was 1941, when 39,969 people were killed, but we're on our way to a new record.

"What a pity that such a price should be in the offing simply because we don't care enough to will it otherwise. You have to care enough.

"What's happening on America's streets and highways today is murder—we might as well call it by its right name. And murder is something that you just don't tolerate in a civilized society.

"Nevertheless, we are tolerating it. We are assuming that it's something that can't be helped. But it can be helped. It must be helped.

"If the terrible traffic death rate continues, you're going to find increasing determination on the part of some to appeal to the Federal Government to take over.

"That is not the answer, unless you want the beginning of a police state. I appeal to you to help us to keep that from happening. The very last thing the present administration in Washington wants is further extension of Federal controls.

"We know—the traffic experts know, our public officials know—that the Action Program is the answer if we just generate the will to put it across. The whole matter is in your hands."

Davis Gastester

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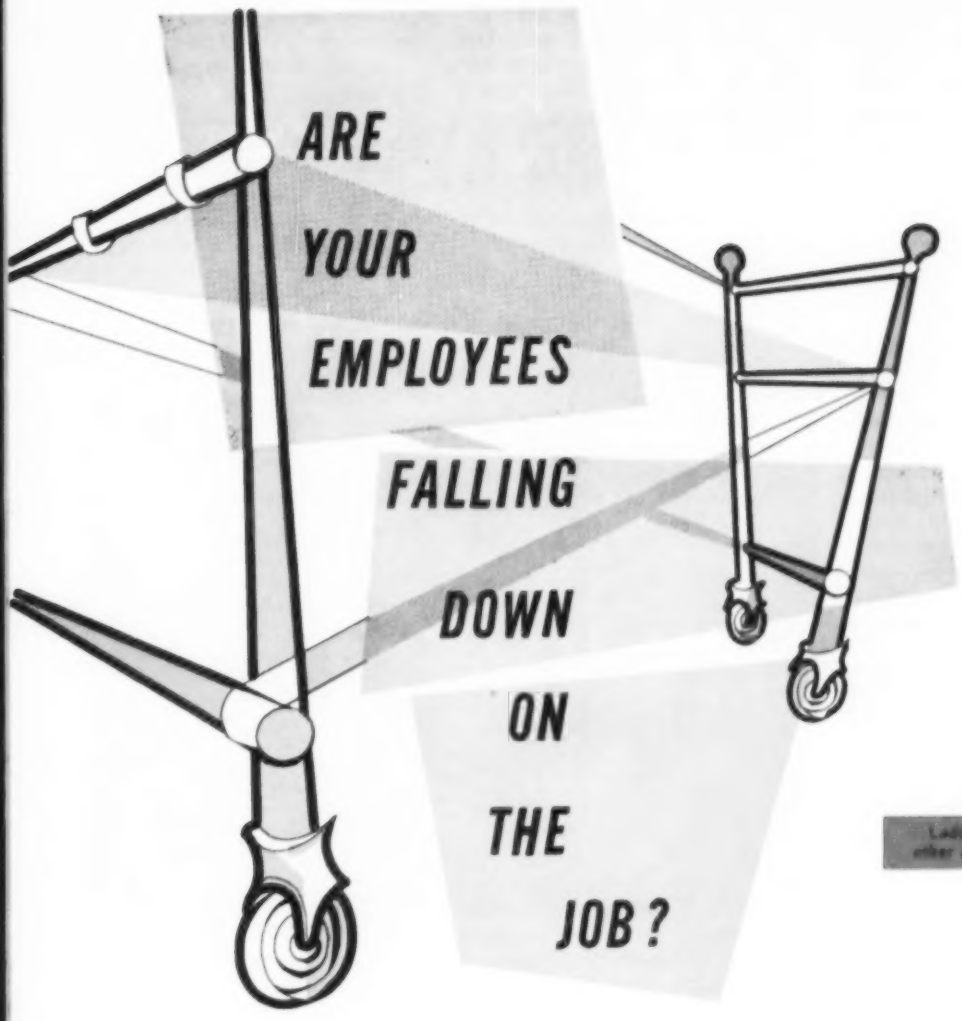


ARE YOUR EMPLOYEES FALLING DOWN ON THE JOB?

Ladder, Scaffold Series
other articles August, Sept.

by **R. L. POTTER**
Supvr., Industrial Safety
American Airlines, Inc., Tulsa, Okla.

There is probably little question as to what constitutes a safe ladder or portable workstand for any given job. One usually knows exactly the type of equipment that is needed for an operation. Few management groups fail to provide what they consider to be safe equipment.

Such organizations as the American Standards Association, Metal Ladder Manufacturers Association, the Association of Casualty and Surety Companies, National Safety Council, and others, have done a wonderful job of providing ladder standards. Their specifications are good. Manufacturers of ladders are cognizant of the users' problems and are building safety into their products as prime selling points. In other words, it isn't too difficult to buy a good ladder that is suitable for most jobs.

If you have a specialized problem where ladders are not the answer, portable workstands which comply with recognized standards are used. But regardless of how much care is used in the selection of ladders and portable workstands, we will continue to have accidents if:

1. They are not used for their intended purpose.
2. They are used improperly.
3. They are not properly maintained.

We have closely analyzed several hundred fall incidents where portable workstands and ladders were involved and failed to find a single instance where good, properly used, properly maintained equipment was the cause.

The term "portable workstands" can cover a multitude of neck breakers. If a man has a quick job to do that is just out of reach from floor level, he is likely to use the nearest and handiest object that will provide the desired elevation. Those in the construction industry will readily think of nail kegs and dynamite boxes in this regard. Those two demons, particularly the

former, caused me endless worry during the ten years I spent in construction safety.

During the war, on one of the large government contracts, we had an iron-clad rule that nail kegs were to be demolished when empty of their original contents. But, like so many other such rules, there was the occasional slip in its enforcement and eventually (usually sooner) a fall resulted.

A carpenter tried to stand on a nail keg while nailing a scaffold member to the side of a building. A few minutes later that carpenter was on his way to the hospital with a broken pelvis.

He later told me that he hadn't wanted to waste the time getting a ladder to do a job which would only take a minute. I think the man was conscientiously trying to save time. He had not, however, been properly educated in safe practices.

If we are to prevent falls or any other type of accident, we can do so only with intelligent first line supervision. Getting these people interested in accident prevention is one thing, educating them to the point where they can prevent accidents is another. Here is an example:

Several years ago on a construction job, we had a very reckless individual employed as a carpenter foreman. He was an excellent mechanic but lacked supervisory experience. The result was submarginal work, and accidents involving members of his crew were frequent.

I spent a lot of time with this fellow, and, in time, he became enthusiastically persistent in his efforts to prevent accidents. He insisted upon the use of personal protective equipment; he urged his men to purchase safety shoes. These were the superficial aspects of the safety program that were within the scope of his capabilities.

One morning I got a call from the dispensary and was advised that one of his men had suffered a broken leg. Immediate investigation of the incident disclosed a perfect example where a supervisor's enthusiasm to do the correct thing, minus technical knowledge, equals disaster.

The injured man had been descending a ladder into a 12-foot pit in which concrete forms were being placed. The ladder, complete with hand rails, was set at a 45° angle. The foreman was very proud of the ladder, pointing out to me the added safety of the hand rail. The results, of course, were obvious. Everyone used the ladder as he would normally use stairs. It was in use less than two hours when the accident occurred.

This was a case of a man who had a "smattering of ignorance" about accident prevention. He was sincere in his determination. He had heard a talk at a safety meeting on requirements for handrails on scaffolds, stairs and platforms. Why not put hand rails on the ladder, he thought. Wouldn't that make it safer? No one had taken time to teach him the basic difference between stairs and ladders, or the critical angles of each.

In aircraft maintenance and operation, we have multitudes of ladder and workstand problems involving a great variety of specialized equipment.

From Portable Stands

A tremendous amount of our maintenance work is done from portable stands and ladders and it takes a variety of such equipment to service a four-engine aircraft which requires service checks from floor level to the top of the vertical stabilizer—30 feet up. The presence of various types and sizes of stands presents problems. It leads to misuse. In other words, stands of insufficient height are sometimes used when it seems inconvenient to walk a short distance to get the proper size. (Remember the nail keg incident?)

Even with our high exposure to the hazards, only two percent of our reportable injuries during the past two years were due to slips and falls from portable stands and ladders. We feel that this is a fine record, although we know that just a little extra effort would have made it near perfect. I say "near perfect" because I do not think it is possible to win the battle against falls completely. My reasons are:

1. Gravity—Falling is simple because it is given a big assist by one of nature's constant laws. Gravity is a strong thing. It is constant. Most other types of accident situations require greater contributions from the participants than shifting one's center of gravity a fraction of an inch too far in the critical direction.

2. Physiological Factor—Some individuals have near-perfect equilibrium. Others lack it to the extent that they experience difficulty in walking a straight line, even without benefit of stimulants which normally produce such action. Athletic coaches will tell you that good balance is a prime requisite for superior athletic ability. This is also true of aircraft pilots. There is little question that the same rule would hold true in any activity which requires muscular coordination. Certainly, working at heights on ladders and stands requires excellent balance.

We can do nothing about gravity, but we can certainly keep an eye out for the fellow whose balance is poor and keep him on the floor. And we can use the time worn **Rules for Tools** and convert them to ladders and stands:

1. Use the right tool (ladder).
2. Be sure it's in good condition.
3. Use it properly.

From an address presented at the 43rd National Safety Congress.

Answers to Lifting Quiz

on pages 12 and 13

1A is correct. A person should never try to lift or carry a load beyond his ability. If the load is too heavy or awkward, he should get help.

2B is correct. In lifting, a person should have a good footing with both feet flat on the floor.

3A is correct. The employee is showing the best way to lift with the load close to the body. In the "B" picture, he is too far away, a stance that will cause unnecessary strain.

4A is correct. The employee bends his knees to get down and lift, instead of leaning over.

5B is correct. In actually lifting, the back should be kept straight, and the lifter should be close to the object. The strong leg muscles do most of the work.

6A is correct. The employees have good grips on the handles on the sides of the carrier rack. (They are also bending their knees instead of making the back muscles lift the load.)

Safety Maintenance SALUTES

A SAFETY IDEA

White Hats for Greenhorns

Identifying new employees by distinctive markings on their wearing apparel is now a recognized safety practice throughout industry. Many plant safety directors and supervisors have learned that if an untrained newcomer can be made to stand out from old hands he can be better safeguarded from known hazards.

At the Duquesne Works of United States Steel Corporation near Pittsburgh, Pa., white hard hats do this job. The specially painted white helmets are required wearing for all new employees during their first 30 days on the job. After a month they graduate to the same brown helmets worn by their fellow workers.

Here's how it works: Suppose a newly hired employee wanders too close to the front of an open hearth furnace after metal has been poured. If the helmet didn't identify him immediately as a new man, older employees might assume he knew what he was doing and had some business being in such a precarious position. But sight of the white hat tells everyone he really shouldn't be there, and a fellow worker warns him of the danger. See the picture on the cover.

William Keenan, Duquesne Works' general supervisor of safety, reports that since the new program was inaugurated last year, there has been a considerable dip in accidents among new employees—almost to the vanishing point. The company buys standard brown helmets, and paints them white.

Supervisor Keenan is a firm believer in safety helmets as a "must" in his protective equipment program. He feels everyone who enters a steel mill should have head protection. Duquesne Works' 7000 employees have seen concrete evidence that Keenan's "musts" should be followed. Several hard-hat wearers have escaped death or serious injury when struck by such things as falling pipe, and a 25 pound clay can which fell 20 feet from an open hearth tapping platform. Although he was seriously injured, one man's life was saved by his hard hat when a 5½ pound brick fell approximately 125 feet and struck him on the head.

Picture by courtesy of Mine Safety Appliances Co.

Cooling Tower Code

Standards for a $100 million industry—cooling towers used for power, process and air conditioning systems—were requested of the American Standards Association at a general conference of manufacturers and users of the towers.

The conference voted unanimously to set up standards according to the procedures of the American Standards Association. They asked the Association to set up a committee composed of technical experts representing cooling tower manufacturers, technical societies, trade associations, safety organizations, groups furnishing materials to tower manufacturers, and users of cooling towers.

They also asked that the work on standards be divided between two subcommittees, one for the field erected towers and the other for factory built towers.

The subcommittees will set up standards on test procedures, materials, mechanical components, fire protection and other safety factors, for towers varying from those used to cool a few gallons per minute to those cooling many thousands a minute.

The conference recommended the American Society of Mechanical Engineers, Cooling Tower Institute, and the Air Conditioning and Refrigeration Institute to serve as sponsors for the project.

Safety Management

Accident costs and control receive up-to-date treatment in "Safety Management" by Rollin H. Simonds and John V. Grimaldi, a 568-page book on safety administration and accident prevention just published by Richard D. Irwin, Inc. (Homewood, Ill., $7.80 list). Simonds is Professor of Management and Chairman, Department of Management and Finance, Michigan State University, and Grimaldi is Director, Industrial Division, and Assistant Manager, Accident Prevention Department, Association of Casualty and Surety Companies.

The new book provides a comprehensive survey of safety management in which many suggestions and procedures are presented in book form for the first time. Particularly new and useful is the section on accident cost analysis in which the most recently developed method of estimating uninsured costs, replacing the old 4 to 1 ratio, is fully explained, together with supporting statistical data and suggestions for using cost figures in securing management backing for safety programs.

New ideas are offered on motivating safety and locating hazards. A new technique for making costs work for, rather than against, the safety program is described. Safety problems in connection with the manufacturing and marketing of new products are given treatment hitherto lacking.

Other sections outline measures and equipment for the control of health hazards, including dust and fume control, noise control and radiation control. Where the physical environment cannot be corrected to minimize accidents, personal protective equipment is essential. The authors describe various types of equipment to protect the eyes and face, fingers, hands and arms, feet and legs, ears, respiratory organs and other specialized protective devices. Space is also devoted to the selection and training of employees and the psychological aspects of accident prevention.

Added emphasis is placed upon preparation for the control of catastrophes. Suggestions are made for the disposal of liquid, gaseous, and operational wastes.

Appendixes list common industrial hazards, their occurrence and properties, and properties of selected flammable materials.

Radiation Safety Primer

The Safety and Fire Protection Branch, U. S. Atomic Energy Commission, has prepared a radiation safety training unit to meet the basic employee training need of organizations having any radiation hazard.

In simple non-technical language it relates radiation hazards to other industrial hazards, makes clear the difference between internal hazard and external hazard, explains what is done to protect the employee, and what he must do to protect himself.

The unit consists of a set of slides, a printed booklet, and an instructor's handbook.

The set of 46 full color cartoon slides is available from a commercial source at $11.50 per set mounted in cardboard, $18.40 per set mounted in glass. (Individual slides rather than a slide film are provided to permit the removal of any slide which is not applicable in a particular instance.) To learn where to buy the slides, write Safety and Fire Protection Branch, U. S. Atomic Energy Commission, Washington 25, D. C.

Line sketches of the slides have been printed in the "Radiation Safety Primer" available from the Government Printing Office at 25 cents a copy, 25 percent discount for orders of 100 or more. The booklet is suitable for distribution to employees. Pages giving specific precautions are printed on one side only—so they can be removed if not applicable.

The "Radiation Safety Primer Instructor's Handbook" provides a commentary on each slide and warns against some pitfalls of radiation safety lectures. Single copies are available from Safety and Fire Protection Branch, U. S. Atomic Energy Commission, Washington 25, D. C. The Instructor's Handbook is not sold by the Government Printing Office.

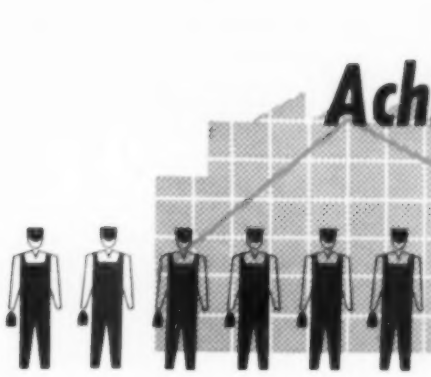
Report on Elimination of Fumes from LPG Trucks

Effectiveness of the OCM Catalytic Exhaust Purifier in cleaning up the carbon monoxide, aldehydes, odors, and hydrocarbons found in the exhaust stream of a vehicle powered with LP-gas is given in a report just issued by Oxy-Catalyst, Inc., Wayne, Pa.

The vehicle used in the test was a Clark Utilitruc, 6000 pound capacity, powered with an LPG converted Continental engine.

The findings show that the catalytic purifier eliminates an average of 99.7 percent of the carbon monoxide, 88.8 percent of the hydrocarbons and 83.9 percent of the aldehydes at governed speed and 100 percent at idle. Moreover, the catalytic equipment effectively reduced the odors caused by the ethyl mercaptan additive used in the LP gas.

The tests showed the presence of carbon monoxide, hydrocarbons and aldehydes in the exhaust stream before it entered the catalytic purifier and indicated that LP-gas powered equipment should not be operated in confined areas without substantial elimination of these noxious substances.



Achievements and Awards

Sturtevant Division of the Westinghouse Electric Corporation at Hyde Park, Mass., has been given an Award of Honor by the National Safety Council for its excellent safety record during 1955. Its injury frequency rate was 71 percent better than its "par" rate, and its injury severity was 30 percent better. "Par" rates are computed from the plant's experience in other years and from the rates of the industry classification to which the plant belongs.

• • •

The first complete, over-all safety program in the history of the Post Office Department, designed to provide greater on-the-job safety for more than half a million postal employees, is being placed in operation, Postmaster General Arthur E. Summerfield announced recently.

Detailed instructions on the new comprehensive program (which began with a motor vehicle safety program in 1954) are being incorporated in the Postal Manual.

"In addition to our concern about motor vehicle accidents, which have been reduced substantially in city areas, we have been much concerned for the more than 400,000 postal employees who do not drive, but who are responsible for the complex operations of mail separation, distribution, transportation, maintenance and supply involved in delivering a letter to the patron's door," Mr. Summerfield said.

This expansion provides for the administration and implementation of the industrial accident prevention and fire prevention programs. In addition, a Postal Supervisor's Safety Handbook will be issued as a guide to assist supervisory employees in administering effective accident prevention techniques.

"Every potential hazard will be studied in an all out effort to reduce on-the-job injuries and fires in postal installations," Mr. Summerfield said. "Postal officials, supervisors and employees alike will be educated in safe work practices and conditions. No employee should begin a new job without proper safety orientation.

"Many of our present problems have been with the Postal Service for many years and have caused untold thousands of injuries."

For example, Mr. Summerfield noted, there are the letter carriers' traditional hazards of broken or icy sidewalks, defective porch steps and unfriendly dogs.

"While we do not anticipate an immediate cure-all for these and other problems, we expect to reduce the hazards by education, use of safety equipment and constant research," he commented. "For example, new-type heels for letter carriers' shoes are being studied as one possible solution to the problem of slippery walks."

The large numbers of back injuries and hernias resulting from manual lifting and maneuvering of hand trucks in postal facilities will receive special attention. Elimination of conditions presenting fire hazards in postal establishments and the provision of adequate fire extinguishing equipment will constitute a large part of the new program.

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Mine Safety Appliances Company's main plant at Pittsburg has completed more than five million

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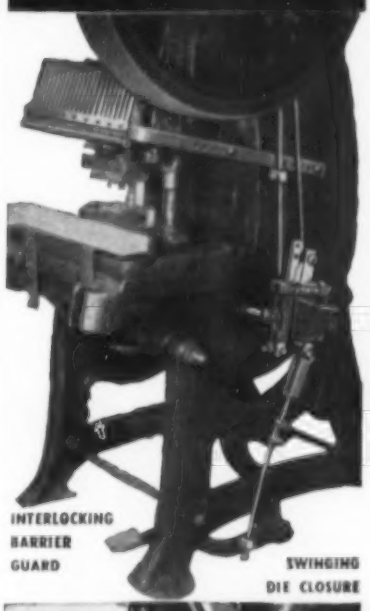

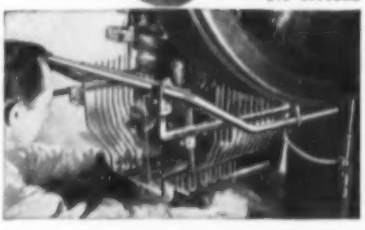

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(Use Key # T-8 on Inquiry Card on page 35)

man hours without a lost-time accident, according to E. G. Sanner, vice president in charge of manufacturing. The plant, which has more than 1,000 employees, has been without a lost-time accident since July 9, 1954. The company's accident frequency rate from December 4, 1929 to December 31, 1955 was only .716, Mr. Sanner said.

MSA employees are provided with the necessary safety equipment to perform their work safely in the plant which produces some 3600 safety products.

Safety Director W. H. Ford attributes the excellent record to four factors: 1. Availability of safety equipment; 2. Program of safety engineering which guards against unsafe machines and procedures; 3. "Selling" safety to employees; 4. Employees' cooperation in the safety program.

• • •

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(For details, use Key # T-9 on card on page 35)

Twenty-five hundred workers of General American Transportation Corporation's plant Number One in East Chicago, Indiana, were honored recently by becoming the first group to win the company's highest four-star safety award. William J. Stebler, president of General American, officiated at award ceremonies held in the plant's safety school, attended by more than a hundred company employees and guests.

Stebler presented a large bronze plaque depicting a riveter at work to William I. Jones, plant general manager, who accepted the award on behalf of the plant's employees. The plaque paid tribute to the employees "in recognition of their accident prevention achievement for two consecutive years."

The plant is engaged primarily in the production of railway freight cars. Its award-winning performance in 1955 was made under exposure of 3½ million manhours, and it became eligible for the four-star award after earning the company's three-star award in 1954.

The plant's 100 percent compulsory safety goggle and safety shoe program made a vital contribution to the plant's safety record, according to Frank Treadway, safety supervisor for the plant. These safety devices prevented many injuries during 1955, he said.

The safety goal attained by the plant was established by the executive safety committee of General American, of which Stebler is chairman. Peter H. Gatte is safety director.

• • •

The Atomic Energy Commission has presented the Chemical Plants Division of the Blaw-Knox Company, Pittsburgh, with a safety award for completion of a year of operation at the National Reactor Test Site, Idaho Falls, Idaho, without a single disabling accident during the year ending December 31, 1955.

Earlier this year, Chemical Plants was awarded first place in Class A division by the Associated General Contractors of America for the safety record established under the direction of E. S. Wright, vice president and manager of construction.

THE FIRE FRONT

Fire Losses Rising

Estimated fire losses in the United States during April amounted to $84,624,000 the National Board of Fire Underwriters has reported. This loss represents an increase of 7.6 percent over losses of $78,632,000 reported for April, 1955, and continues the trend that has been noticeable since the first of the year.

Losses for the first four months of 1956 now total $354,952,000, an increase of 8.5 percent over the first four months of 1955, when they amounted to $327,140,000. These estimated losses include an allowance for uninsured and unreported losses.

Atomic Disaster Fires

Development of the "hydrogen bomb" and similar thermonuclear devices by the United States and other nations necessitates a review of the role which fire fighters may play in the event of a wartime catastrophe. With sufficient manpower, training and equipment the fire services can do much to limit the extent of the devastation.

A bulletin of the National Board of Fire Underwriters points out that every nuclear explosion has four distinct effects—blast, heat, immediate radiation and residual radioactivity. The first three effects are instantaneous and their areas of devastation increase with the increasing energy yield of the new weapons being devised. For example, the nominal atomic bomb can ignite wood at a distance of more than a mile from the detonation point and can cause moderate skin burns at a distance of nearly two miles. A thermonuclear weapon (equivalent to 10 million tons of TNT) can ignite wood at an estimated distance of eight miles and can cause skin burns at a distance of more than ten miles. Damage and injury from blast and immediate radiation are limited to areas which are smaller than those affected by heat.

Contamination from the fourth effect of a nuclear detonation—namely, residual radioactivity, can extend far beyond the limits of heat and blast damage. The extent will depend on (1) the height at which the explosion occurred, (2) the nature of the earth's surface immediately below, (3) the direction and velocity of the winds and (4) the occurrence of rain. If the fireball touches the earth's surface, large amounts of radioactive materials are drawn up as fine particles into the bomb's cloud. These particles gradually fall to the earth over a cigar-shaped area extending downwind from the point of detonation.

The harm resulting to humans from exposure to nuclear radiation depends on the type of radiation, the rate of radiation and the total radiation dose. The unit for measuring radiation effect is the roentgen. In routine work and in training exercises involving radiation, 0.3 roentgen has been established as a maximum weekly permissible dose for the whole body. In medical therapy, exposures as high as 5,000 roentgens are made but only on small portions of the body and for extremely short periods of time.

In the 1954 test with a thermonuclear device at the Pacific Proving Ground the area contaminated by radioactive fall-out followed a cigar-shaped pattern, extending 220 miles downwind and 20 miles upwind. The maximum width was 40 miles. Radiation dosages in the downwind direction for the first 36 hours following the detonation were as follows:

10 miles – 5,000 roentgens
100 miles – 2,300 roentgens
125 miles – 1,000 roentgens
160 miles – 500 roentgens
190 miles – 300 roentgens

At the 160-mile distance the fall-out was observed in the form of snow-like particles. It began eight hours after the detonation and concontinued for several hours. About 7,000 square miles of territory downwind from the point of burst was so contaminated that survival might have depended upon prompt evacuation of the area or upon taking shelter and other protective measures.

Instruments Required

Human senses cannot detect nuclear radiation directly and the detection is accomplished with instruments. These instruments are based on the ionization which takes place in a gas enclosed in a tube as the radiation passes through the tube. By making the tube part of an electronic circuit the radiation can be detected as a meter reading or an audible signal. One such instrument capable of detecting only high level intensities in the range of 0.5 to 50 roentgens per hour should be sufficient for a fire company. It would be used when fire fighters are the first to enter an affected area and also to supplement information obtained from civil defense units. A system of recording and transmitting radiological information by remote control is presently being studied and tested. It is known as the Radiation Telemetering System and will be of much assistance to fire fighters. However, the need for on-the-spot monitoring will not be completely eliminated.

For the individual fire fighter there are available several types of dosimeters designed to be carried on the body. These include pocket

ionization chambers as small as fountain pens and small badges containing photographic film packets. In the latter device the film is darkened by radiation and, after developing, it can be compared with known standards. A third device is the phosphate-glass dosimeter, a piece of chemically-sensitized glass worn about the neck like a "dog tag." It is normally colorless under ultra-violet light but after exposure to nuclear radiation it will fluoresce and the fluorescence can be compared with standard sources to indicate the total exposure received.

In emergency operations where appreciable amounts of radiation are present, one should not hesitate to accept an exposure to the whole body of 25 roentgens in a single day. For decisions concerning repeated exposure the following statement may be used as a guide: exposure of 25 roentgens per day at weekly or longer intervals for a total of eight exposures (200 roentgens) may be experienced without serious loss of efficiency due either to immediate illness or early significant deterioration in health. Before each re-exposure the degree of radiation damage already produced and that to be expected should be evaluated by medical personnel.

Internal radiation injury due to ingestion of radioactive particles must also be considered. They may enter the human system by inhalation of dust or fumes, by eating or drinking contaminated food and water and by exposure of open wounds. Two isotopes—radiostrontium and radioiodine—constitute the principal internally-hazardous radioactive materials produced by atomic weapons. Radiostrontium has a tendency to concentrate in the bones, radioiodine in the thyroid gland.

Since radioactivity cannot be destroyed, the radioactive material must be removed by various decontamination methods. When working in a contaminated area, a quick hose-down of the area may reduce the exposure significantly. Later it may be necessary to use steam, detergents, solvents or abrasives to either clean or remove the contaminated surfaces. The intake of radioactive materials into the body must be minimized in all cases. Smoking, eating and drinking should be avoided in radiologically "hot" areas. Respiratory protection will be required where the contamination is in the form of radioactive dusts. Both clothing and body should be thoroughly scrubbed after leaving the contaminated area.

Certain procedures should be kept in mind by fire fighters from neighboring communities as they approach areas seriously damaged by a nuclear explosion. Where there is radiological contamination, forward progress should be halted at the intensity level set by fire headquarters. Fire fighting operations can be carried on in the regular way with a radiological check every hour to see that tolerance doses are not exceeded. Firemen who are caught in a high intensity area may have to take shelter. The rate of exposure indoors on the first floor of an ordinary frame house in a fall-out area would be about one-half the level out-of-doors. In the basement the radiation level would be about one-tenth that out-of-doors. The fire chief will have to consult with the civil defense authorities to balance the need for early fire fighting in fall-out areas with the necessity for conserving fire fighting for more demanding operations.

Combustible Gas Alarm

Instruments developed as safeguards against the hazards of explosive and toxic gases are finding greater utilization in various types of process control applications throughout industry. An example of this is at Lederle Laboratories Division of American Cyanamid Company, Pearl River, New York, where more than 500 pharmaceutical and biological products are manufactured.

In producing the famed antibiotic, Aureomycin, at Lederle Laboratories, a residual cake is obtained. The company's scientists determined that this cake has exceptional growth-stimulating properties when used as a supplement in animal and poultry feeds. It contains small amounts of Aureomycin.

The problem, however, was to remove from this residue a volatile chemical solvent, aliphatic alcohol, picked up during extraction of pure Aureomycin. The cake is processed in a three-story apparatus, a Wyssmont drier, where the solvent is removed and reclaimed for further use. To maintain a constant check on the percentage of solvent in the cake, Lederle technicians installed a combustible gas alarm. The instrument serves a dual purpose: It sets off visible and audible alarms if the amount of solvent in the dried cake is great enough to cause the atmosphere in the discharge conveyer to reach a pre-determined alarm level of 27 percent of the lower explosive limit. When this happens, operators have time to investigate and take corrective action before any significant amount of hazardous solvent-wet cake is discharged from the drier.

At the same time, the instrument serves as a process control apparatus because it indicates whether the drying process is malfunctioning. If the Aureomycin cake contains too much solvent and the vapor concentration within the conveyer increases as determined by the analyzer, operators can make necessary adjustments.

The combustible gas analyzer is located in the main control panel of the Wyssmont drier. Air samples are piped about 150 feet from the drier to the analyzer. In the instrument, the sample is passed through a detector cell containing one of two heated platinum wires which form a balanced electrical circuit. The second wire is housed in a compensator cell containing uncontaminated air. Any combustible solvent in the air sample is burned on the heated wire. This unbalances the electrical circuit in direct proportion to the percentage of solvent in the sample. When that reaches 27 percent of the lower explosive limit the alarm circuit is energized.

Picture by courtesy of Mine Safety Appliances Co.

How Electronics Safeguard Combustion

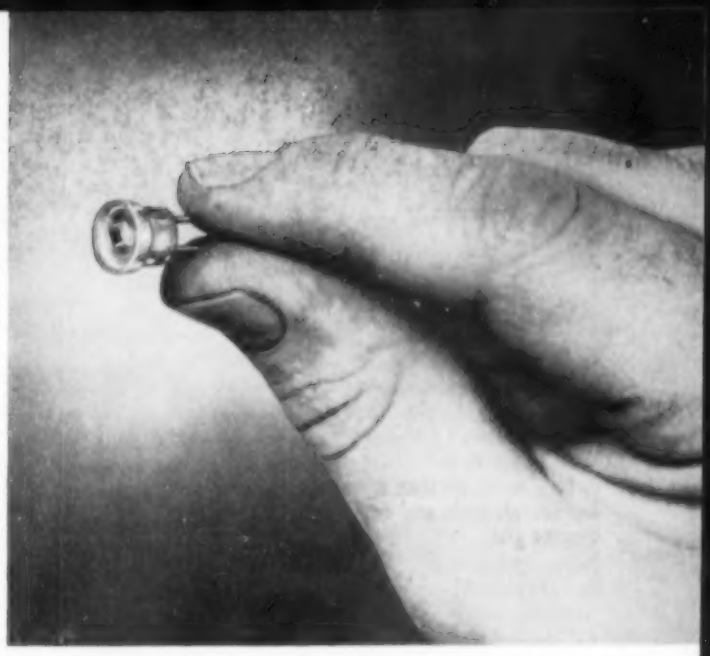

Figure 4
Displayed above is the lead sulphide cell enabling scanners to "see" both gas and oil flames. Its development advanced flame safeguards.

by **P. K. RYDER**
Electronics Corporation of America
Combustion Control Division

The hazards which exist in burning fuel comprise perhaps the most widespread and therefore one of the most serious of all industrial hazards. To burn fuel safely is strictly a matter of timing or limiting the amount of fuel that can be present in a combustion chamber if there is no normal flame. Explosive conditions develop so rapidly in combustion chambers that it is impossible to expect a human being to act fast enough to prevent a "puff," "furnace explosion," or "rapid expansion of volatile gases," call it what you will. That is why there is a need for electronic flame safeguard controls which can react immediately to a hazardous condition.

Let us take a look at what leads up to a furnace explosion. (See Figure 1.)

A. Approximately 50 percent of all reported losses occurred during burner lightoff, caused by situations such as:

1. No pilot flame
2. Inadequate pilot flame or too long a trial for ignition of the main fuel
3. Inadequate purge of the furnace prior to lightoff

B. Approximately 35 percent occurred because the fuel was not shut off fast enough following a flame failure caused by circumstances such as:

1. Flame blowout
2. Off ratio firing
3. Water in the fuel supply
4. Down draft
5. Momentary loss of fuel

C. Approximately 15 percent are caused by a miscellaneous group of circumstances such as:

1. Improper soot blowing
2. Electrical fires
3. Unknown causes

A safe, closely controlled burner lightoff sequence will guard against furnace explosions during lightoff. The obvious safe lightoff sequence (see Figure 2) is basically:

First, start the blowers and purge the furnace, making sure that not less than four complete air transfers take place.

Then, establish the pilot flame and prove its presence at a point in the combustion chamber where reliable ignition of the main fuel is assured.

Only after the pilot flame is proved, may the main fuel valve be opened.

After not more than fifteen seconds for light oil or gas and sixty seconds for heavy oil, the pilot flame is shut off. The main flame

TWO MAJOR CAUSES OF FURNACE EXPLOSIONS:

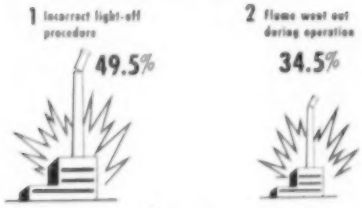

Figure 1
New systems enforce right light-off methods, shut down burners seconds after flame failure.

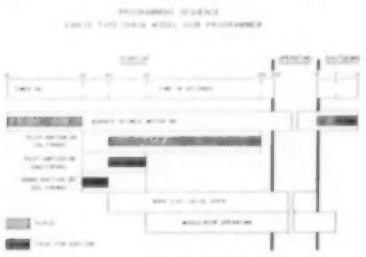

Figure 2
The "programmer" times industrial gas or oil burners' operations. Each step has own limit.

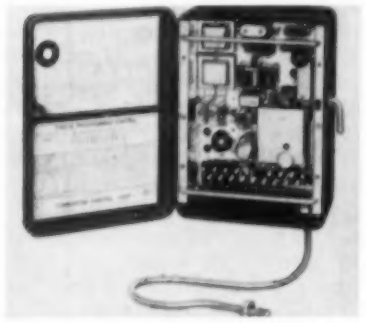

Figure 3
Unit above incorporates programmer, scanner. Letter monitors gas or oil flames visually.

must now be burning reliably.

The firing linkage may drive to its high fire or normal operating position any time after the main fuel valve opens.

Fast acting electronic flame safeguards (see Figure 3) are required to guard against furnace explosions caused by loss of flame and subsequent restoring of fuel delivery to the combustion chamber with no established means of ignition. When accidental loss of flame is detected, the fuel must be shut off immediately.

It is obvious that even the finest burner controls and control systems cannot guard against every possible hazardous condition. For example, in the case of soot explosions it is necessary to depend on the operator for safe performance. If he chooses to clean soot when the fire is not burning and when the combustion chamber is hot, he is playing Russian Roulette with his personal safety and the safety of the equipment.

Through the years flame detectors for burners have developed from:

1. Drip pots—when these receptacles became filled with unburned oil, they operated a linkage which shut off the fuel. This was merely an anti-flooding device and provided little, if any, protection.

2. Thermal devices—most common is the "stack switch." It is a bi-metallic coil inserted in the breeching or stack of the boiler. When heat strikes it, the coil unwinds and operates a switch which permits fuel to flow to the burner as long as the coil is hot. If flame fails, the coil cools and winds up, opening the switch which shuts off the fuel.

3. Photocells and Flame Rods—to obtain faster detection of flame and loss of flame, photoelectric devices were developed. These units were actuated by the light of an oil flame. Because photocells cannot see a "blue" gas flame, flame rods were developed for electronic gas flame detection. Flame rods depend on the ability of a gas flame to conduct minute electrical currents for their operation.

Photoelectric and electronic flame rod detectors provided the industry with the first approach to fast-acting devices necessary to provide the degree of safety required to protect against the operating hazards. However, several major installation and operating problems exist with these devices. Photocells cannot differentiate between light from a flame and light from incandescent refractory. Flame rods get hot and burn, short out from dirt, and are difficult physically to install.

Figure 6

In this package control system are included all regular units, some optional equipment.

4. Lead Sulphide (PBS) cells (see Figure 4) offer the same speed of response as the photocells and flame rods, and eliminate most of the installation and operating problems that existed previously. They detect the infra-red radiation from a flame and therefore are capable of "seeing" any flame regardless of the type of fuel used. These detectors are designed to operate only when exposed to the "dancing" or "flickering" infra-red energy which is radiated by a flame. In this manner, the lead sulphide flame detector cannot be actuated by other sources of heat such as hot refractory, sunlight, electric lights, etc.

There are several other devices which find limited use today. Closed circuit television is used to assist the operators of large steam generators. They are not used as safety devices and do leave much to the interpretation of the viewer. Gas analyzers watch for a change in the exhaust gases and if they approach an explosive mixture the operator is warned. Gas analyzers are not far beyond the experimental stage today. The theory of their operation is basically sound and it may well be that in future years new safeguard systems will use this basic technique.

Every investigation and survey of furnace explosions and firing practices has turned up facts and statistics that to the layman would dictate a complete new deal in the theory and practice of burning fuel safely. However, as we all know

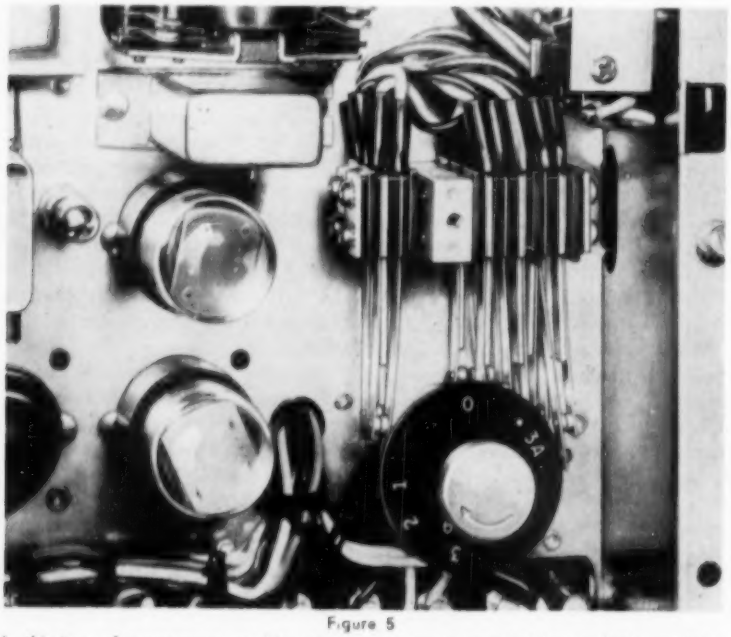

Figure 5

In this type of programmer, positive sequence timing is provided by the knob and indicating disc (lower right). Cam switching assemblies are driven by synchronous motor.

from experience, progress often comes about slowly. Steady advances have been made through the years, and particularly of late we find many industry representative organizations setting down recommended standards which more adequately recognize the problems at hand. These, together with a better understanding of the hazards by equipment manufacturers, engineers and users, insure that the safety of a fuel burning installation is not left to chance.

The design and manufacture of today's industrial burner safety controls takes into consideration:

A. Rugged design to insure long, satisfactory operation. In many cases, inexpensive components that find acceptance in certain electronic devices are totally unacceptable in these safety controls.

B. Positive sequence timing. (See Figure 5.) There can be no drifting of the timing periods due to varying ambient temperatures, line voltage, etc. Synchronous motor driven cam switching assemblies fill this need in many cases.

C. Fail Safe circuits. Obviously, any internal failure must cause burner shutoff and prevent the burner from operating in an unsafe manner.

D. Design Requirements. All designs must comply with Underwriters' Laboratories and Factory Mutual standards for equipment of this type.

E. Instantaneous flame detection and positive fuel shutoff and latch-out following any flame failure. A dropout delay of approximately two seconds is standard for these units to prevent nuisance shutdowns due to the normal transient shifting of flames in a combustion chamber.

It has been common practice in past years to assemble and wire the complete control system on the job. Now it is accepted practice to have the control system assembled in a cabinet, pre-wired and tested, and delivered to the job with only a minimum amount of field wiring required (see Figure 6).

A well designed and manufactured product is only half the job done. Accurate installation of the right units for the right job, together with competent on-the-spot field engineering, testing, and operator training completes the picture. One without the others frequently provides a situation that is worse than nothing at all. This fact is coming more to the front today and it is encouraging to note the amount of effort and expense that is being put forth by the industry as a whole for the better training of installation and service-maintenance personnel. Today adequate electronic equipment and know-how combine to provide an answer for "Burning Fuel Safely."

From an address delivered to 55th Annual Massachusetts Safety Conference, Boston.

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Work Injuries in Canning

This Report # 101, "Work Injuries in the Canning and Preserving Industry," contains a detailed analysis of the frequency and severity of injuries experienced in that branch of the food industry.

This report may be obtained free of charge by directing your request to the Bureau of Labor Statistics U. S. Dept. of Labor, Washington 25, D. C.

Edited by HENRY M. GROSMAN
Counselor at Law, Newark, N. J.

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FEDERAL EMPLOYERS' LIABILITY ACT
—Failure to Provide Safe Place to Work

In an action under the Federal Employers' Liability Act, a railroad switchman was properly granted a recovery for injuries sustained when he fell because of the uneven footing on the road bed where the evidence was sufficient to sustain the finding that the railroad failed to provide a safe place to work. The court ruled that the evidence relating to the condition of the track was properly admitted in evidence upon the general question of whether the railroad was or was not guilty of negligence in respect of the condition and situation complained of. Affirmed.

ATLANTIC COAST LINE RAILROAD CO. VS. GUNTER, United States Court of Appeals, Fifth Circuit, No. 15,559, February 13, 1956. Appeal from the United States District Court, Southern District of Florida.

SILICOSIS—Mine Standards—
Common Law Liability

Although it was obvious that a worker had contracted silicosis after working for eight years in the mines, the defendant proved that the usual or ordinary precautions for safety and health were in effect in its mines. The establishment of this fact precluded the recovery under Pennsylvania common law.

PRATTICO VS. THE HUDSON COAL CO. (1943) 32 A. 2d 733.

WILFUL MISCONDUCT AND VIOLATION OF SAFETY RULE—Burden of Proof

A power lineman for a utility company was properly denied compensation for burns sustained when he came into contact with an energized primary wire. The employer sustained the burden of proving that the injured employee's failure to wear rubber gloves in violation of a company safety rule constituted wilful misconduct, precluding him from recovery under the compensation act. The evidence showed that one of the gloves the claimant was wearing showed evidence of a burn, which fact indicated that the claimant touched the live wire with his hand. The court ruled that if a safety rule is reasonable and is known to the employee and is for his benefit and yet he intentionally disregards it, then he is guilty of wilful misconduct within the meaning of the statute. Affirmed.

MILLS VS. VIRGINIA ELECTRIC AND POWER CO., Virginia Supreme Court of Appeals, No. 4411, November 28, 1955.

FEDERAL SAFETY APPLIANCE ACT—
Noncompliance with Act

In an action under the Federal Safety Appliance Act, a railroad switchman was properly granted a recovery for injuries sustained when he had to get down from the freight car and go between the cars to aline a coupler because he observed that it would not couple automatically. The court ruled the Safety Appliance Act requires that cars be so equipped that they will couple automatically by impact and can be coupled and uncoupled without the necessity of persons going between them. The operation of a car on which the drawbar is so far out of line as to prevent automatic coupling violated the Act and imposes absolute liability. Affirmed.

KANSAS CITY SOUTHERN RAILWAY CO. VS. CAGLE, United States District Court of Appeals, Tenth Circuit, No. 5203, December 27, 1955. Appeal from the United States District Court, Northern District of Oklahoma.

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(pages 2 and 3)

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from the CARELESS ACTS of others the WISE MAN corrects his own
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Audiometer **589**
Audivox, Inc. An illustrated booklet describing an audiometer with test tones at ten frequencies from 125 to 8000 cycles. Operating instructions, testing procedure, etc., are fully explained, as is a method of charting the results of audiometric measurements.

Ear Protection **590**
Mine Safety Appliances Co. A 4-page, illustrated folder describing three types of ear protection devices. Information includes specifications and recommendations on the use and maintenance of the equipment.

Vibration Mounts **591**
Robinson Aviation Inc. Shock and vibration control mountings for the operation of machine tools, business equipment, etc., are featured in this 8-page booklet. The all metal mountings with stainless steel cushions are illustrated, and dimensions, load ranges, and recommended applications are given.

FLOORING

Ready-To-Lay Flooring **592**
The Monroe Co. Durable 2 ft. x 3 ft. preformed sections of ready-to-lay flooring, able to withstand heavy industrial loads, are described in this illustrated bulletin. Specifications, application data, and installation sketches are provided. The flooring material can be applied over concrete, wood, or metal, new or old.

Floor Surface Hardener **593**
Walter Maguire Co., Inc. Described in this 4-page brochure is a long-lasting floor surface hardener which, applied to newly-laid concrete surfaces, produces an anchored, heavy-duty surface flooring. Includes recommended specifications, estimating data, materials, mixing, and application information.

Abrasive Floor Surfacer **594**
The Hallemite Mfg. Co. A semi-plastic, synthetic resin material, containing abrasion-resisting grit, that can be applied to most types of floor surfaces to make them slip-proof is described in this 4-page brochure. Detailed information concerning application, coverage, drying time, etc., are furnished for the floor surfacer.

SIGNS

Traffic Signs **595**
Kaiser Aluminum & Chemical Corp. 12-page booklet contains information on a line of aluminum traffic signs and railroad crossbucks. Fully illustrated, it lists sizes and designs of various sign blanks available, and information on the methods used in finishing the sign panels.

Eye Hazard Signs **596**
Stonehouse Signs, Inc. Illustrated, and in color, this informative bulletin features a line of eye hazard and goggle signs. The bulletin lists dimensions, order numbers, and prices of the various signs illustrated.

ELECTRICAL EQUIPMENT

Diesel Power Plants **597**
Caterpillar Tractor Co. A 16-page booklet showing the many uses to which a line of diesel-operated power plants can be put. Available in permanent or portable models, the units are illustrated and described along with a series of self-regulating generators.

Conductor Systems **598**
Insul-8-Corp. 31-page booklet describes a series of enclosed conductor systems for cranes, monorails, moving machinery, etc., which eliminate the hazards of bare electric conductors. Full use is made of drawings and pictures to illustrate the systems. The well-written, highly informative material includes installation and engineering data, parts information, methods of selection, etc.

Snap Switches **599**
Micro Switch Div., Minneapolis-Honeywell Regulator Co. 43 uses for snap-action switches are described in this informative, 16-page booklet. Complete with photographs and drawings, the wide variety of applications shown emphasize the improved safety, lower costs, and production increases possible with the use of the switches.

ATMOSPHERE CONTROL

Atmosphere Analyzer **600**
Harold Kruger Instruments. Described in this illustrated bulletin is an atmosphere analyzer for detecting and recording concentrations of pollutants. The instrument gives a continuous record of ozone, nitrogen dioxide, nitric oxide, and sulfur dioxide present in the air. Advantages and operating principles are detailed.

Exhaust Hoods **601**
American Air Filter Co., Inc. Informative booklet features several designs of exhaust hoods for dust control in the woodworking industry. Fully illustrated, it describes the localized applications in this specialized field, such as for sanders, saws, etc.

MATERIALS HANDLING

Acid Pump **602**
Thompson Mfg. Co. Illustrated bulletin features a portable pump to transfer acids from small, open, storage and plating tanks. Information includes specifications and recommendations for the power-driven pump.

Stair Climbing Hand Truck **603**
Valley Craft Products, Inc. Features of a stair climbing hand truck are detailed in this illustrated, 4-page brochure. The various models available for specific jobs, such as hauling barrels and drums, pressurized gas tanks, cases, etc., are shown, and specifications and prices for each are given.

(Continued next page)

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Ross Carrier Div., Clark Equipment Co. 4-page, illustrated brochure on a 20,000 lb. capacity pivoted hook carrier. Information includes a listing of the carrier's advantages, and a simplified table of available models and their specifications.

Adjustable Shelving 605
Hallowell Div., Standard Pressed Steel Co. Tips on how to plan installations and order shelving in more than 1000 combinations to fit any storage or supply-handling need are summarized in this 27-page catalog. Drawings of basic units and accessories, suggested floor plans, a shelf-capacity chart, and photographs of completed units make the catalog a useful guide to planned storage.

Pallet Dollies 606
Magline Inc. Illustrated bulletin on a light-weight pallet dolly of magnesium construction. Provides information on models, sizes, load capacities, construction features and other pertinent data.

Portable Lifts 607
Oster Mfg. Co. The advantages of using portable lifts to transfer materials within plants are explained in this informative brochure. Photographs of the lifts in operation illustrate some of the uses to which they can be put.

PERSONAL PROTECTION

Wide View Goggles 608
Pulmosan Safety Equipment Corp. Two new series of goggles which feature wider viewing area, lighter weight, and attractive design are reviewed in this 4-page brochure. Sizes and advantages of the various models available are given.

Coated Work Gloves 609
David's Gloves, Inc. Featured in this illustrated brochure is a line of coated work gloves, including plastics, neoprenes, synthetics, terries and jerseys. Information concerning sizes, styles, and prices is also listed.

Safety Hats & Caps 610
Fibre-Metal Products Co. Bulletin describes a line of safety hats and caps molded of thermosetting, Fiberglas-reinforced, polyester resin. The bulletin also shows the hats and caps available in combination with face shields, helmets, and spectacles.

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- **Has an accident or fire interrupted production?**
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As a service to its readers, "Safety Maintenance" will arrange to supply manufacturers literature on the following subjects. Just insert the key number on the Readers Inquiry Card on the preceding page and be sure to fill in your name and address. If you need information on a specific type of product, simply write it in on the Inquiry Card.

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105	Hard Hats
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108	Women's Protection Clothing
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110	Safety Gloves
111	Foot Protection
112	Anti-Slip Soles
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130	Resuscitators
	DUST & FUME CONTROL
137	Carbon Monoxide Control
	FIRE PROTECTION
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144	Degreasing Machines
146	Fire Blankets
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170	Ladders & Safety Devices
171	Scaffolds
172	Work Platforms
173	Slings
	GUARDS
175	Machine Guards
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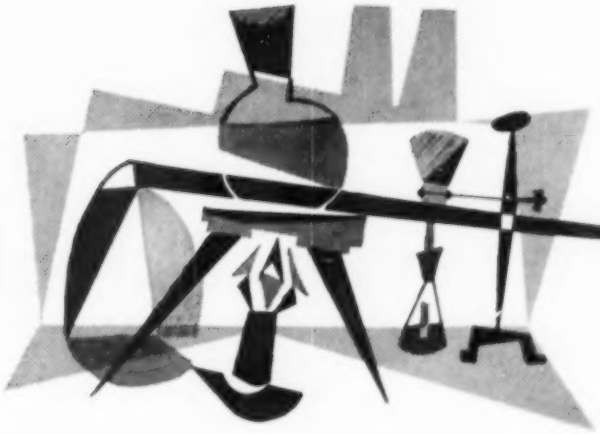

industrial hygiene

Table Tops May Be Health Hazard

Restaurants and institutions which scrupulously maintain sanitary standards in the kitchen may still overlook a source of food contamination on the surfaces of tables and counters, according to a recent survey made by Richard D. O'Neill and Ernest Reed of the Department of Plant Sciences of Syracuse University. This survey was undertaken with the cooperation of the Commissioner of Health and the Bureau of Food and Sanitation of Syracuse, New York, with grants from the paper place mat and doily industries.

Doctors O'Neill and Reed took samples by means of swabs from the surfaces of tables and counters in ten different types of eating establishments: hotel cafeteria, luncheonette, sea food restaurant, diner, a bar and grill, public cafeteria, drugstore fountain, variety store fountain, short order house, and a restaurant catering to the college trade. The surface materials of these tables and counters were wood, glass, plastic and linoleum. Cleaning methods varied from soap and water to chlorinated cleaners.

In the ten eating places tested, using seven different kinds of cleaning techniques on five different kinds of table or counter tops, bacterial counts ran as high as 800,000 per square foot. In some cases the bacteria present were of the coliform group which may include serious disease-producing organisms.

In order not to interfere with the operation of the eating place, samplings were made during times of the day when they would not upset normal operations at peak hours of business. Because workers may not be as careful during rush hours, contamination might well have been worse during those periods than is revealed by the survey results.

The survey revealed that bacteria counts on uncovered service surfaces ranged from zero to 800,000 per square foot. Doctors O'Neill and Reed pointed out that for this reason no operator can be sure of his cleaning method. They commented: "These extremes were frequently found in samples from the same restaurant taken on the same day. This is a not unexpected finding in view of the enormous number of inconstant factors which can appreciably affect the incidence and survival of microflora on restaurant serving surfaces."

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Acoustics Conference

More than 500 of the world's leading authorities on sound and noise control took part in the second International Congress on Acoustics in Cambridge, Massachusetts, last month.

Harvard University and the Massachusetts Institute of Technology were joint hosts for the international meeting. The sessions were held in conjunction with the 51st meeting of the Acoustical Society of America, a member society of the American Institute of Physics.

The technical program for the Congress was organized around three major symposia:

Bioacoustics and noise control—human responses to sound (including hearing, psychological response, and biological effects) and noise control methods based on these responses.

Architectural and musical acoustics—the production of music and speech sounds and the design of enclosures for good hearing conditions.

Physical acoustics and sonics—acoustical studies of matter, propagation of sound, and application of acoustical techniques to technical problems.

There were special demonstrations of speech analysis and synthesis. Special exhibits were prepared for the Congress by many scientific, technical, and manufacturing concerns throughout the world.

by **LAYMON N. MILLER**
Bolt Beranek and Newman Inc.
Consultants in Acoustics
Cambridge, Massachussetts

Noise Levels, Actual

(Editorial Note: This is the second of a series of articles on noise control in industry. In this article recommended noise levels are given for various areas and situations found in typical offices and industrial plants. A number of examples of typical noise levels measured in various work areas are also presented.)

In last month's article on noise we learned of some of the presently accepted findings and attitudes concerning (1) the influence of noise on work output, (2) the annoyance of noise, (3) the interference of noise with speech communication, and (4) the effects of noise on hearing loss. We might summarize those findings here, for they will serve as the basis for setting up certain noise level criteria for many of our everyday commercial and industrial noise situations.

With regard to **the influence of noise on work output,** there appears to be considerable evidence that the presence of noise does not significantly affect the mental or motor skills of individuals. With prolonged exposure to noise, persons become adapted to the noise environment and can learn to concentrate on the task at hand without being adversely influenced by the noise. It appears, however, that high noise levels give rise to annoyance, irritability, and possibly fatigue. A recent release [1] from England tends to confirm these observations and in addition suggests that in high noise levels the ability to maintain attention and alertness over long periods of time is impaired.

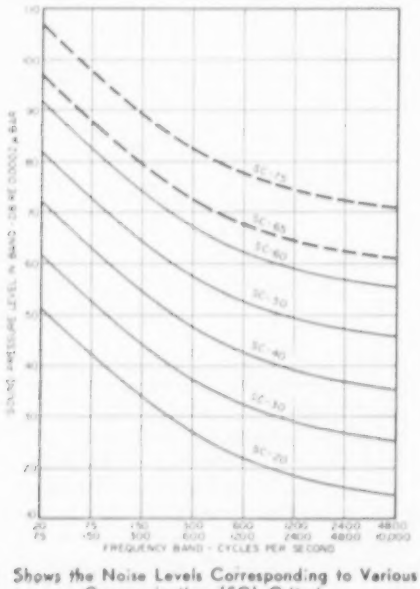

Figure 1 Shows the Noise Levels Corresponding to Various Speech Communication (SC) Criteria

In regard to **the annoyance of noise,** we recognize that noise may represent an intrusion of our privacy; it may interfere with our ability to concentrate on a thought-provoking problem; it may startle or frighten us; it may be entirely inappropriate to the occasion. Many of the annoying aspects of noise are related to its type and to its duration and relative intensity compared to the "ambient" or background noise to which we are accustomed. Possibly also the annoying aspects are related to the social, legal, political, or economic connotations of the noise.

In many situations the presence of noise seriously restricts **speech communication** and thereby contributes in varying degrees to delays, difficulties and errors. For good speech intelligibility, average speech levels must be approximately 18 db above background noise levels in the frequency range most used in the transmission and reception of speech. This large difference is required because normal speech has such a large "dynamic" range, approximately 30 db, between strong and weak speech syllables even at a uniform voice level. We have also learned that the frequency region of 300 to 6000 cycles per second (cps) is most important in the transmission and reception of speech.

Recent studies of noise in industry have indicated some fairly definite trends toward **hearing loss** by individuals exposed for long periods to high noise levels. Actually, we all have a gradual reduction in hearing acuity as we grow older, but it appears that working in high noise level areas for a number of years will give somewhat more hearing loss than normal.

Based on extensive collections of quantitative data on these various effects of noise, we are able to set up schedules of noise levels which are considered acceptable for various situations. We shall try to cover

and Desired

TABLE I

Average Voice Levels Required in Various Noisy Environments for Reliable Continuous Speech Communication with Unlimited Vocabulary

Average Background Noise Levels in Speech Frequency Bands (600–1200, 1200–2400, 2400–4800 cps) DB RE 0.0002 MICROBAR	Approximate Voice Levels and Distance
30	Normal Voice at 10–20 ft
40	Raised Voice at 10–20 ft or Normal Voice at 3–6 ft
50	Very Loud Voice at 10–20 ft or Raised Voice at 3–6 ft or Normal Voice at 1–2 ft
60	Very Loud Voice at 3–6 ft or Raised Voice at 1–2 ft

TABLE II

Average Voice Levels Required in Various Noisy Environments for Acceptable Discontinuous Speech Communication with Limited Vocabulary

Average Background Noise Levels in Speech Frequency Bands (600–1200, 1200–2400, 2400–4800 cps) DB RE 0.0002 MICROBAR	Approximate Voice Levels and Distance
65	Shouting at 10–20 ft or Very Loud Voice at 3–6 ft or Raised Voice at 1–2 ft
75	Shouting at 3–6 ft or Very Loud Voice at 1–2 ft

here a cross-section of noise levels found in business and industry, and we shall attempt to show how each increasingly higher noise level category produces increased restrictions on personnel activity.

Noise Levels

Because acoustics is still a fairly limited-interest field, it is necessary to note a few special noise and noise measurement terms which will be used in this and the following article. These terms relate to the manner of designating noise levels. First, noise levels, or sound pressure levels, are expressed in a logarithmic unit, the **decibel** (db). The lowest sound pressure just audible to the average human ear is called the **threshold of hearing** and has become accepted as the reference pressure for the noise level scale. This reference pressure is 0.0002 microbar (one microbar is one-millionth of standard atmospheric [barometric] pressure), and is 0 db on the noise level scale. An easy rule of thumb to remember is that every time the sound pressure is doubled, relative to the reference pressure of 0.0002 microbar, the noise level is increased by 6 db. To help acquaint the reader with a reasonable range of noise levels, a few fairly typical noises having the following approximate noise levels are given here (all noise levels are in db relative to the reference pressure of 0.0002 microbar):

20 db—a whisper at approximately 5 ft distance; or the light rustling of leaves in a nearby tree.

40 db—average conversational speech at a normal voice level as heard at approximately 30 to 40 ft distance outdoors; or the average outdoor background noise in a quiet residential neighborhood of a large city at night.

60 db—average conversational speech at a normal voice level as heard at approximately 3 ft distance; or general office noise in a small office containing a few persons; or the noise inside a typical building (with windows closed) due to average-to-heavy automobile traffic outside.

80 db—noise level on the ground for a large commercial airliner flying overhead at an altitude of approximately 1000–2000 ft; or 75-piece orchestra as heard in the middle of a concert hall; or the noise along a busy street due to near-steady flow of automobiles and light trucks.

100 db—noise level inside a subway train at normal speeds; or noise level inside a large textile plant due to a room full of weaving looms; or noise level in the pressroom of a large city newspaper; or the noise level at the operator position of a 25-to-50-ton high-speed automatic punch press.

120 db—noise level beside a coal car being unloaded by a 20-HP coal car shaker; or the noise level at the operator's position of a pneumatic chipping hammer at work on large steel plates; or the noise level at the operator's position of a pneumatic riveting gun on an aircraft assembly; or the noise level 200 ft to the side of a runway for a large commercial airliner at take-off power.

The noise levels given for these various noises include all components of the noise throughout essentially the full audible range of the ear. They tell us nothing, however about the tonal characteristics of the sound.

Frequency Distribution of Noise

Another important aspect of noise is its frequency distribution. A Sound Level Meter is capable of recording the total noise level of all the audible range of a noise in the frequency region of 20 cycles per second (cps) to 10,000 cycles per second (as in the

examples given above). A Sound Level Meter might indicate a total noise level of 100 db for an ambulance siren at a distance of approximately 100 to 200 ft or for the inside of the passenger cabin of a commercial airliner cruising at 250 to 300 mph or for the hissing sound of an air hose used for cleaning purposes in a shop. Even though the noise level of each of these three noise sources is approximately 100 db, we recognize that each noise has a different characteristic sound. The difference is largely in the frequency distribution of the sound. For the ambulance siren, the noise is principally a single frequency, and most of the noise energy is concentrated in a single frequency or a narrow band of frequencies. For the cabin noise in the airliner, the noise level is highest in the low frequency region (due to engine exhaust noise and propeller noise) and decreases in the higher frequency regions. For the hiss of the air hose, most of the noise is in the high frequency region and a relatively small amount of noise is in the low frequency region. And, of course, there are any number of other characteristic frequency distributions found for various vehicles, manufacturing equipment, and assorted noise-making devices.

In order to comprehend the nature of a noise problem we must know something of the frequency distribution of the noise. One standard piece of noise measurement equipment which can show the general frequency distribution of the noise is an Octave Band Analyzer. An Octave Band Analyzer usually consists of a group of 8 filters, each approximately one octave wide in band width, with which it is possible to determine the noise levels within each of the following frequency bands: 20–75 cps (sometimes 37.5–75 cps for a true octave bandwidth), 75–150 cps, 150–300 cps, 300–600 cps, 600–1200 cps, 1200–2400 cps, 2400–4800 cps, and 4800–10,000 cps. Other special-purpose analyzers having narrower bandwidths are used for more precise scanning of the noise spectrum, but we will confine our interest here to data from a conventional Octave Band Analyzer. For most engineering purposes, octave band noise levels will give an adequate description of the frequency distribution of the noise.

There are a number of other general characteristics of noise sources and noise measurements, but for the present we will be concerned principally with noise levels and frequency distribution.

Speech Communication in the Presence of Noise

To arrive at a practical schedule of acceptable noise levels for various situations, let us start with the influence of noise on speech communication. This area has been studied most thoroughly, and quantitative data are best known. The approach described here is a much-simplified version of the many studies and experiences which have gone into setting up a workable schedule of the interference effects of noise on speech communication. A step-by-step discussion of the material used in arriving at this process is given in one of the recent practical textbooks on acoustics.[2]

We have noted earlier that the frequency range 300–4800 cps is the most important range in the transmission and reception of intelligible speech information. For most common noise environments, the frequency range 600–4800 cps is found by experience to represent adequately the actual frequency range most used in speech communication (usually the background noise tends to mask the speech levels in the 300–600 cps frequency range). Thus, we designate the three octave bands 600–1200 cps, 1200–2400 cps and 2400–4800 cps the "speech frequency bands." We will now observe the influence of background noise levels in these speech frequency bands on the ability to communicate.

In an essentially quiet room, with no distinctly audible noise sources heard in the room, relaxed conversation can be carried on quite easily with a normal voice level and can be heard and comprehended at a distance of, say, 10 to 20 ft. Now if a background noise level of up to approximately 30 db in the speech bands were permitted in the room, it would be observed that the relaxed conversation could be continued without noticeable interference. If the background noise levels were increased gradually, the speaker would begin to talk louder and the persons in the room might wish to move closer to the speaker. When the noise levels in the speech frequency bands fall in the range of 50 db, the speaker may have to speak with a raised or loud voice for listeners at distances of 3 ft to 6 ft away. When the noise levels reach approximately 60 db in the speech frequency bands, continuous speech communication is possible but not particularly comfortable. For still higher noise levels, it is too much of a strain to carry on prolonged discussions, and conversation tends to become intermittent. The conditions for reliable speech communication with an unlimited vocabulary are summarized in Table I, where the approximate voice level and listener distance are

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given for a range of average background noise levels in the speech frequency bands.

When high noise levels tend to discourage continuous communication, it is still possible to carry on an acceptable degree of intermittent speech communication with the use of a restricted vocabulary consisting of coded words or shouted warnings. The conditions for this type of discontinuous speech communication are shown in Table II.

The background noise levels considered above have been limited to the principal speech frequency bands between 600 cps and 4800 cps. We must also consider the influence of noise in the frequency region below 600 cps. Low frequency signals of a given sound pressure level usually do not seem as "loud" to us as high frequency signals of the same sound pressure level. For the purposes of our discussion here, it is observed that individuals seem to show about 20 to 30 db higher sensitivity to octave bands of noise in the upper frequency bands in the range of 1000 to 10,000 cps than they do to octave bands of noise in the low frequency region of 20 to 200 cps. This fact is taken into account in arriving at our schedule of acceptable noise levels based on speech communication.

For example, if a background noise level of approximately 40 db in the speech frequency octave bands limits speech communication to the use of a normal voice level at a distance of 3–6 ft (from Table I), we may have 20 to 30 db higher noise levels, say 60 to 70 db, in the low frequency bands without resulting in any apparent increase in loudness or without resulting in any increase in interference with speech.

Based on these findings, Fig. 1 presents a family of noise level curves which define reasonably well the noise level distribution with frequency band for various degrees of speech communication. For example, the curve labeled SC-40 indicates noise levels of approximately 40 db in the speech bands 600–1200, 1200–2400, and 2400–4800 cps, and noise levels up in the 60's and 70's for the low frequency bands 20–75 and 75–150 cps. This particular curve thus presents the noise levels in the various frequency bands which will permit acceptable speech communication in a given area, where according to Table I, a normal voice level can be heard and understood at a distance of approximately 3–6 ft. The label SC-40 is used to designate this noise level curve: "SC" for "Speech Communication" and "40" for the average 40 db noise levels in the speech frequency bands. This curve is called a Speech Communication Criterion curve.

The other curves given in Fig. 1 represent other Speech Communication Criteria and may be related to the degree of speech communication possible under such noise level conditions by referring to Tables I and II. For the conditions of Table I, it is noted that the speaker is facing the listener and that an unlimited vocabulary is used. For the high noise level considered in Table II, a restricted pre-arranged vocabulary is taken as an aid toward acceptable discontinuous speech communication. Note that this has been carried out quite successfully in aircraft communication problems.

Now the noise levels shown in Fig. 1 are, on the average, the maximum noise levels which will just permit reliable speech communication for the voice

levels, distances and conditions given in Tables I and II. In some instances, an individual or a group of persons may have the need or desire for lower noise levels than these maximum values. In a sense this need is related to the annoyance of noise, which we shall discuss next.

In last month's article on the effect of noise on human behavior we found that annoyance is a relative sort of thing. A mosquito doesn't make much noise but it certainly is annoying. In a sense other noises are more or less annoying depending upon the already-present noise environment and what we are doing in that environment. We also learned from the previous article that noise does not appear to influence work output, but that continued exposure to high noise levels possibly gives rise to irritability, annoyance, fatigue, and reduction of alertness. In this discussion we will presume to include something of all these aspects under the general heading of annoyance. Noise levels vs. annoyance in office and industrial situations is a subject which is not well documented, so we base our decisions on judgment, a number of past experiences, and the extensions of laboratory findings obtained under somewhat idealized test conditions.[3]

We have just learned something of the interference of noise on speech communication. We will use the speech communication criteria as the basis for setting up generally acceptable noise levels for particular situations and then modify the criteria for specific instances where annoyance might be a factor. To illustrate this approach let us consider two examples which we have recently encountered in our consulting firm.

In one, a blast of noise is to be emitted by a large supersonic wind tunnel for a period of approximately fifteen to thirty seconds' duration approximately once each hour of the working day. It is desired by the wind tunnel user that his own company personnel at work in nearby buildings not be startled at the onset of each blast nor become annoyed by the continued repetition of the noise at the specified intervals. Taking into account the frequency distribution of the noise, the "peak factor" of the noise, the build-up time for the noise to reach a maximum, and the relative proportion of "time-on" to "time-off" for the wind tunnel noise, and taking into account the nature of the work performed by the nearby company personnel, it was suggested that the noise levels caused by the wind tunnel operation could be permitted to exceed by approximately 10 db the average background noise levels (based on the speech communication criteria) which would normally exist in the particular work areas in question.

In another annoyance problem, an executive office of a bank was situated just above the basement mechanical equipment room of a large building. The mechanical equipment consisted principally of the air conditioning equipment for heating and cooling the entire building. The refrigeration system included a centrifugal compressor which generates a strong acoustic pure tone signal—the turbine "whine." Considering (1) the relatively greater annoyance of single-frequency or narrow-band-width noises, (2) the continuous operation of the compressor during the entire working day (in the summer), and (3) the prestige

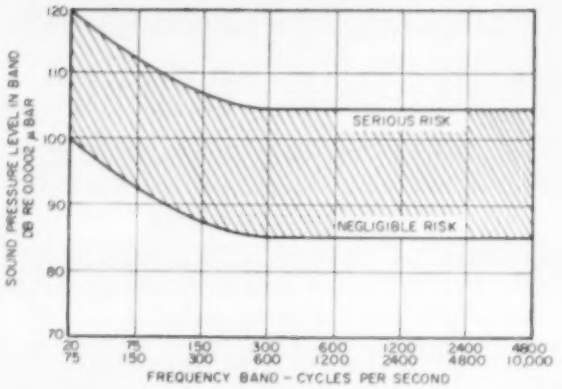

Figure 2 Hearing Damage Risk Criterion for Wide-Band Noise (Risk of hearing damage for lifetime or long-time exposure to indicated noise levels at rate of approximately 8 hours per day)

value of the executive office, measures were taken to reduce the noise levels of the turbine whine to at least 10 db below the average background noise levels of the office in the range of frequencies near the frequency of the turbine whine. The turbine could still be detected during quiet periods in the office but it was considered to be unobjectionable.

These two examples do not represent the entire range of possible annoyance problems, but they demonstrate the somewhat variable nature of some of the factors which contribute to the annoyance of noise. It is of interest to note that in these two examples, the noise levels of the unwanted noises were permitted to range from well above to well below the average background noise levels in the critical area or office. Thus, it is seen that there is no firm criterion for judging annoyance. Instead each annoyance problem has to be decided on the basis of the individual problem. A bit of judgment will help one to decide whether the objectionable noise should be kept below the background noise or whether it might be permitted to exceed the background noise.

Hearing Damage Criteria

Data were presented in last month's article concerning the effects of long time noise exposure on hearing ability. Based on a careful evaluation of all the available information on noise and hearing loss, tentative criteria have been drawn up[4] and used by some groups working in industrial noise problems. In Fig. 2, noise levels as a function of frequency band are plotted for a range of possible risk of hearing damage for an average population. Our consulting firm uses these curves as guides for recommending noise conditions in industry which will avoid or minimize possible hearing loss due to long time exposure to high noise levels. These curves cannot be used to estimate the possible extent of hearing damage or to predict the possible onset of hearing loss to an individual. It is emphasized that the curves are engineering guides. Individual hearing loss problems are best studied individually with proper medical and audiometric analysis.

Fig. 2 presents a range of noise levels for wide band noise which may give rise to some risk of hearing damage in an average population exposed to these

noise levels for many years at a rate of approximately 5 hours per day or 40 hours per week. For long time exposure to the noise levels along the lower edge of the cross-hatched area there is negligible risk of any permanent hearing damage. For long time exposure to noise levels along the top edge of the cross-hatched area or higher there is a risk of significant hearing loss for some individuals in an average population. Because different persons have different degrees of susceptibility to hearing disorders it is recommended that audiometric tests be given periodically to all employees working in noise levels which fall within or above the levels given by the cross-hatched area of Fig. 2. In this way those few individuals who are found to be most susceptible to hearing loss can be singled out early and given work in less noisy surroundings. This direct approach is beneficial both to the individual and to the company.

Applications of Noise Level Criteria

We have just seen briefly the development of two sets of noise level criteria: one for acceptable speech communication (with suitable modifications for effects of annoyance), and one for preservation of hearing. Where ideal speech communication conditions are required, low noise levels are essential. Where less stringent requirements are placed on speech communication, higher noise levels may be permitted. Finally, where preservation of hearing is the ultimate requirement, long-time exposure to high noise levels must be controlled. We will now list a few typical working situations in which specific criteria normally would be applicable. It will be seen that the recommended noise levels are determined largely by the functional use of the area and the type of work performed by the occupants of the area.

SC-20—Radio broadcast studios, concert halls, legitimate theaters.

SC-25—Executive offices.

SC-30—Conference rooms.

SC-35—Private offices, libraries.

SC-40 to SC-45—Large offices where only moderately good speech communication is required.

SC-50 to SC-55—Secretarial offices (typing), accounting offices (business machines) where the need for good speech communication is not essential.

SC-60 to SC-70—Factories, shops, test areas, large vehicles, etc., where intermittent speech communication is required but continuous speech communication is not essential.

SC-70 to SC-80—Factories, shops, test areas where continuous speech communication can be omitted but shouted words or warnings or acoustic warning signals (buzzers, bells, sirens, etc.) are required.

Negligible Hearing Damage Risk Levels—Factories, shops, test areas where speech communication is impossible but essentially complete protection of hearing is required.

Serious Hearing Damage Risk Levels—Factories, shops, test areas where speech communication is impossible, but where systematic audiometric testing is carried out and where employees regularly use hearing protection devices.

Of course we recognize that it would be very desirable if all of us could have low noise levels in our offices and plants, but many of the mechanical devices with which we work do no permit this economically or practically. Thus we frequently must accept certain noisy conditions and pattern our operations around these conditions. For such conditions, we apply the SC-65, SC-75 and Damage Risk Criteria, not because we want to limit speech communication, but because we are forced to live with noise and choose to select enough safeguards to reduce the hazards of this kind of work.

Throughout this series of articles we have confined our interest to noise problems inside offices and plants. Although there are many outdoor noise problems, too (many related to industrial noise in residential neighborhoods), we will not consider those here. It is pointed out, in this regard, that the noise level criteria which have been discussed above do not apply to outdoor noise situations. Reference 2 and 4 of this article and reference 6 of last month's article discuss a noise level criterion analysis applicable to many types of neighborhood noise problems.

There are usually four steps involved in the noise reduction process. The first step is to determine the existing noise levels involved in the particular noise problem. This is done by direct measurement of the noise levels or it can be done by estimating the noise levels based on the general operating characteristics of the noise maker. The estimating process implies that someone has already measured the noise characteristics of a representative group of the particular type of noise maker for a reasonable range of operating conditions.

The second step is to select the criterion which is to be applied to the problem. This results in the selection of the ultimate noise levels which are desired. The required amount of noise reduction is then the difference, in decibels, between the existing noise levels and the desired noise levels.

The third step in the noise reduction or noise control process is to devise and evaluate the effectiveness of various noise treatments for a given noise problem. This evaluation step is being worked on continuously by the various designers and manufacturers of acoustical materials and acoustical treatments throughout the country. From this work it is possible to determine the most economical treatments (economical in size, weight, acoustical effectiveness and cost) which can be applied to a particular noise problem.

The fourth step is the design and installation of the noise control treatment. The design is based on the specific application or extension of a known and evaluated treatment to meet the specific noise reduction requirements of the problem. The installation brings together all the major noise control items and the minute attention to detail which contribute to the final satisfactory solution of the noise problem.

Examples of Noise Levels in Business and Industry

In anticipation of next month's article on some actual noise control treatments, let us review rather briefly a few noise problems which have come to our firm during the past few months. We will include here a brief synopsis of the problem as presented by

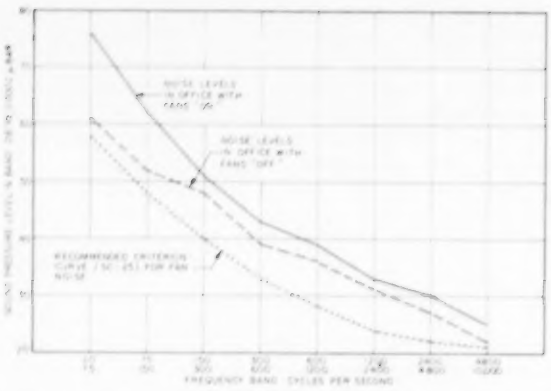

Figure 3 Measured Noise Levels and Recommended Criterion for the Office of the President of a Large Organization (Case I)

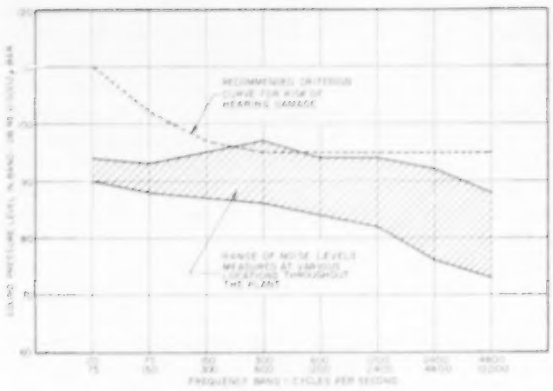

Figure 4 Measured Noise Levels and Recommended Criterion for a Rock Crushing Plant (Case II)

the client, the actual noise levels measured at his site, the recommended criterion for his situation, and the required noise reduction, if any, to meet the required criterion.

CASE I—The president of an organization was disturbed by the noise of two large air conditioning fans (one 25-HP fan and one 100-HP fan) located on the floor above his office. Noise levels measured in the office while the fans were operating are given by the solid line of Fig. 3. Noise levels measured in the office when the fans were off are given by the dashed line of Fig. 3. These latter noise levels, attributable to outside traffic and other unidentifiable noise sources in the building, were considered by the president to be satisfactory. An SC-25 criterion curve (dotted line) was selected as the noise reduction goal for the fan noise levels so that they would be somewhat below the ambient noise levels in the office. The required noise reduction of fan noise to meet this criterion is the difference, in decibels, between the solid curve and the dotted curve for each of the frequency bands.

CASE II—The manager of a rock crushing plant feared that his men might suffer hearing loss through exposure to the high noise levels which existed throughout the plant. The range of noise levels measured at various typical operator positions in the plant is shown by the cross-hatched area of Fig. 4. The

(Continued on page 56)

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by **DR. ROBERT J. PIERCE**
Mansfield, Ohio

Occupational dermatitis is one of the most serious problems of industrial medicine. The fact that an average of 65–70 percent of all occupational diseases are industrial dermatitis which represents over 50 percent of the total indemnities paid out for occupational diseases, is in itself reason for concern and action. Reference can be made to annual state bulletins of Workmen's Compensation Statistics for confirmation of staggering figures in time lost and indemnities paid. The average compensation cost per case was $268.00 in 1954.

There has been an alarming increase in skin diseases since 1937. The impetus of war production resulted in innumerable new technological methods, many of which utilized materials highly irritative and sensitizing to the skin. Now a great number of the developments have been projected into today's production picture. This problem cannot be satisfactorily solved unless adequate steps are taken to safeguard the employee. The loss in time is irreparable. The loss in terms of dollars and cents from the standpoint of both management and the individual worker runs into millions of dollars annually. To be aware of the scope and acuteness of the problem is to demand the fundamental steps in its solution.

Occupational dermatoses are abnormalities or inflammations of the skin directly caused by the occupational environment and are compensable if they cause lost time of one week or more. Non-occupational dermatoses are aggravated by occupation and may become occupational.

Industrial dermatitis may be produced by direct action of a chemical on the normal skin at the site of contact, if applied in sufficient intensity or quantity and for a sufficient length of time, as by a primary irritant. It may also be produced by an agent which, on first contact, produces no demonstrable change, but on later and further contact, produces an eruption at the site or in distant portions of the skin, as by a skin sensitization or sensitizer. A primary irritant may also be a sensitizer, but cannot be spoken of as such until the sensitization action can be seen or demonstrated. The allergenic dermatitis can be confused and appearance changed by changing occupations, humidity and home conditions. The dermatitis is the result of the mechanical, physical and chemical action of all substances contacting the workers' skin. It is an observable fact that certain individuals upon repeated contact may develop a dermatitis, but can by repetition of his contact become hyposensitive, or as the workers label it, can be "hardened" to their occupation. Sensitivity works both ways.

Since World War II, industry in the United States has continued to be plagued by many varieties of industrial dermatoses, estimated to cost more than $100,000,000 annually. The majority of these have been attributed to contact with: cutting oils, solvents, greases, rubberized compounds, strong soaps, alkalis, cements, acids, trauma and accidental injury, and physical and biological agents. Although allergy plays

a prominent role in industrial dermatoses and accounts for some of the most difficult problems, nevertheless, primary irritants are responsible for 80 percent of contact occupation dermatoses and sensitizers for only 20 percent.

A discussion of the relationship between industry and medicine should show the increasing responsibility of the medical profession not only to disease of the individual, but also to his economic and industrial position in society relating to the disease.

I am primarily concerned with occupational skin diseases or diseases brought about by failure of the employer to create a safe place in which to work and/or diseases produced by conditions to which all employees more or less are subject and which produce the disease as a natural incident of a particular occupation.

Is it Occupational?

An industrial dermatitis, as previously stated, is an inflammatory disease of the skin in which occupational exposure can be shown to be a major causal, contributory or eliciting factor. There must be proof that this is of an industrial nature. The patch test is helpful, but not the final answer in diagnosis of occupational dermatitis. Failure to improve after two months away from work indicates non-occupational dermatitis as a rule but not always.

Proof cannot always be absolute, but the medical opinion must be based on observable facts:

1. When, where and how did the eruption start?
2. Was the eruption relieved by absence from work?
3. Did the eruption recur when patient returned to same work?
4. The dermatitis should start on the areas exposed: face, neck, arms; may spread.
5. Dermatitis should not localize or characterize a non-industrial dermatitis as lupus, psoriasis, lichen plannus, etc.
6. Properly applied patch tests to the contactants at work should produce a similar reaction to that of dermatitis.
7. Other workers are usually affected.

After these criteria are observed and followed it must still be remembered that an occupational dermatitis may continue for long periods after irritants or allergens are removed. My favorite analogy is that "once the fire is started there are a great variety of fuels that will keep it burning."

Preventive Measures

Prevention in the plant begins with the appraisal of the skin in the preplacement examination. Blonds, redheads, and light skinned people are always more susceptible to dermatitis. People with dry, scaling skins (icthyotic) should be avoided as well as the opposite (seborrheic) oily skins with dandruff or acne. The man applying for work with an allergic history of present or past hayfever, eczema, or asthma may be more dermatitis-prone. Many people with hayfever or asthma are aggravated by the inhalation of dust and fumes. Young males develop more acute dermatitis than older men or women, although the older worker has more long lasting, chronic skin diseases.

New employees with non-occupational skin diseases as psoriasis or lichen planus should not be given jobs where excessive trauma occurs. For soon you will have an occupational disease as a result of aggravation of a pre-existing condition. Some skin diseases are definitely known to be made worse by cuts and scratches. After the patient is employed with these things in mind, it is still advisable to carry on a program of periodic skin examinations. This is especially advantageous if the plant physician has had some dermatological training.

After the employee is on the job he should be educated to the health hazards of his job with warning placards on each machine. This job analysis can even be carried to the unions for their cooperation and help in educating the worker in that particular industry.

The most important aspect of education is through personal methods. The worker should be instructed as to the use of protective clothing such as gloves, sleeves, aprons, face shields, coveralls, respirators, masks, protective creams or petrolatum or lanolin.

Personal cleanliness, in my opinion, is the most significant single factor in the prevention of occupation dermatitis. Good, easily accessible washing and locker facilities should be provided for the worker, regardless of how dirty the job. If necessary, showers should be compulsory, with daily changes of outer clothing and underwear. Our problem with dust and fumes found the skin erupting even in what appeared to be protected areas. Therefore, we emphasize cleanliness from the skin out. It may even be necessary for the company to buy and launder clothing, with the expense compensated for by fewer skin diseases among the worker plus happier industrial relations.

Where easily accessible washing facilities are not obtainable, cleanliness can still be maintained through the use of waterless cleaners. These are not complete cleaners, but will remove the large percentage of dirt from the skin. A can of one of these with clean wiping cloths should be placed handily by the worker's machine.

After the worker is properly cleaned, next comes the plant itself. The floors and walls of the plant should be kept clean and in the process of cleaning, dust should be kept down by vacuuming and wetting floors before sweeping. The worker should be encouraged to take company time to keep his equipment clean.

In the manufacture of rubber today there are a considerable number of factors within the plant which operate to cause and spread any potential source of dermatitis which may result from the use of chemical compounds. The number of chemicals in use in rubber manufacture is already very large, and the number of chemicals projected for future use is even larger. Many of the projected chemicals are even more irritative and toxic than some of the worst offenders used in the past. We may be able to isolate the particular compound or compounds which are causing present dermatitis difficulty, but there is no assurance that a change in production necessitated by advances in rubber technology will not bring this problem back into focus in a week or month from now. Furthermore, the determination of the specific chemical or chemicals involved, while possible, is difficult, ex-

pensive, and time consuming and the resultant benefits may be only transitory. Once a group of workmen become sensitized, further sensitization is made relatively easy and this process, in many instances, is progressive to the point where materials, once only mildly irritative, become intolerable to some individuals. Corrections should protect even though there are changes in the chemicals used.

At the Mansfield Tire & Rubber Co., our big improvement, to which we attribute a marked reduction in dermatitis, was through our dust and fume abatement program. With the feeling that much of our trouble was carried to the worker in the air, we found a number of cases who were affected in the throat, chest, eyes and nose, although the skin bore the main brunt of our problem. We added more intake and exhaust fans where indicated, and ran exhaust stacks to the roof tops. Exhaust hoods were made to fit individual machines, depending on the type and amount of dust and fumes leaving that machine and escaping into the workers' atmosphere. Through the use of air movement the air became cleaner and heat as well as dust and fumes abated. Improper ventilation was corrected to prevent the recirculating of dust laden air. A neighboring plant was even contacted to reduce its smoke and fumes which were blowing toward our plant and contaminating the fresh air intake. Steam was kept from workers and any irritants were totally enclosed to prevent odors and vapors from reaching the worker. Our improvements reduced dermatitis incidence by 80–90 percent.

In Mansfield, our first concern was improving plant ventilation. Into this project went many thousands of dollars. We also attempted to reduce excessive heat radiation which, if not controlled, lead to excessive perspiration. Excessive perspiration or moisture close to a man's body aid in the absorption of toxic or irritative dust, fumes, or vapors, thus increasing their concentration and local effect on the individual and thus accentuate an outbreak of dermatitis.

When all plant and personnel cleanliness is at a maximum and the dermatitis continues or recurs periodically, then with good physician-personal relationship, a job transfer for the employee must be obtained. Then one would expect a final end to the skin eruption. However, even with the doctor in complete control of the patient and with everything avoided, the dermatitis may continue.

It is at this point the Safety Director throws up his hands and begins to wonder if the old saying about the dermatologist that "no one dies with dermatitis or gets better, but keeps coming forever," is not true. In defense of the dermatologist, I would like to point out a few reasons that some of these skin eruptions do continue or recur. In the first place, the skin lesion can spread or broaden locally through the patient's own circulation, both lymphatic and blood. This spread can be caused by over-treatment by the doctor himself or from overzealous help from the nurse in the plant dispensary. In the acute stages of most occupational dermatitis, the treatment emphasized should be conservative. Other external contactants on the irritated skin can add to the spread other than medications as soap, water, or from hobbies carried

(Continued on page 57)

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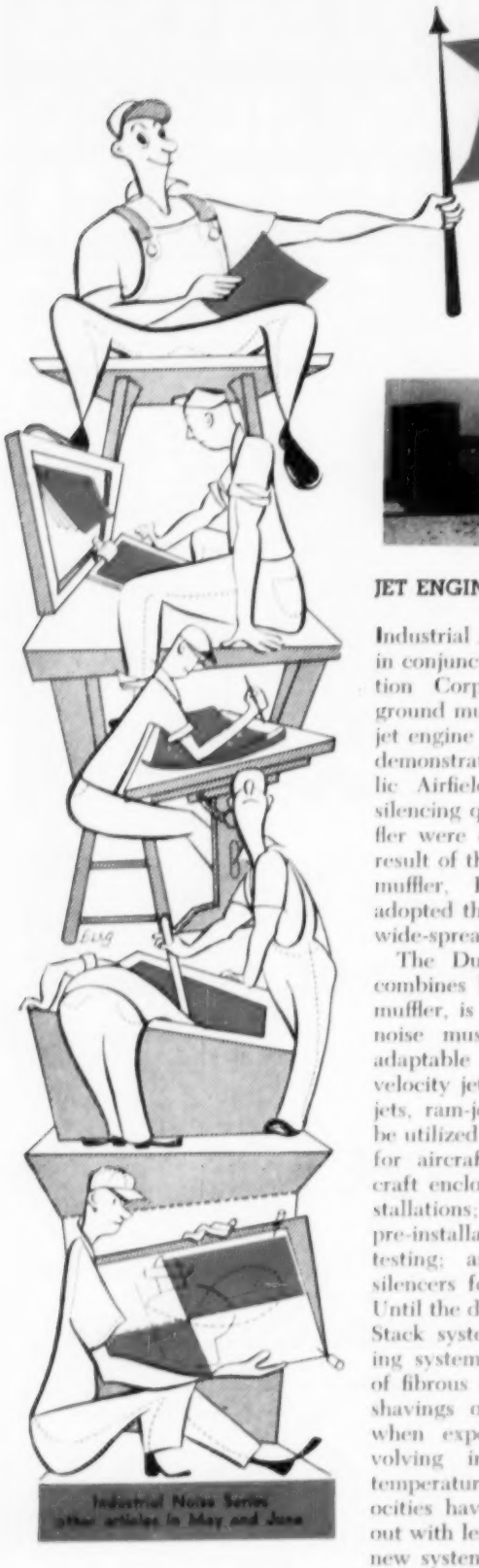


JET ENGINE SILENCING SYSTEM

Industrial Acoustics Company, Inc., in conjunction with Republic Aviation Corp., unveiled the latest ground muffler of their Dura-Stack jet engine silencing system. In the demonstration held on the Republic Airfield in Farmingdale, the silencing qualities of the new muffler were effectively shown. As a result of the success of this ground muffler, Republic Aviation has adopted the Dura-Stack system for wide-spread use at their plant.

The Dura-Stack system, which combines both an augmenter and muffler, is applicable wherever jet noise must be silenced, and is adaptable to all forms of high velocity jet streams such as turbo-jets, ram-jets and rockets. It can be utilized in fixed engine test cells for aircraft engine research; aircraft enclosures for large fixed installations; engine test stands for pre-installation and maintenance testing; and small gas turbine silencers for ground airport units. Until the development of the Dura-Stack system, conventional silencing systems depended on the use of fibrous materials, stainless steel shavings or copper wool, which, when exposed to conditions involving intense vibration, high temperature and exhaust gas velocities have been known to blow out with less than a year's use. The new system's all steel construction uses absolutely no filler material, no metal lighter than ¼" steel plate, and requires less than half the water used by conventional silencers. This is due to the fact that the all steel construction can withstand higher operating temperatures than conventional silencer systems. Its muffler uses no water.

For details, use **Key # NC-1** on Inquiry Card on page 35.

SOUND AND VIBRATION ANALYZER

A high speed analytic instrument, the Panoramic Sonic Analyzer, to aid in reducing destructive vibrations and acoustic annoyances, has been developed by Panoramic Radio Products, Inc. The instrument provides on a cathode ray tube an instantaneous graph of the amplitude and frequency of vibration and noise components. By electronic means, the analyzer tunes repetitively, once per second, at a logarithmic rate, through a frequency range from 40 to 20,000 cps. The height of each deflection indictates the either relative or absolute magnitude of its corresponding component. The tube screen provides a continous overall view of the spectrum.

The analyzer is said to be widely used in the development and production line testing of home appliances; business machines; jet, rocket, and reciprocating engines; hydraulic systems; rotating machinery; and other devices which

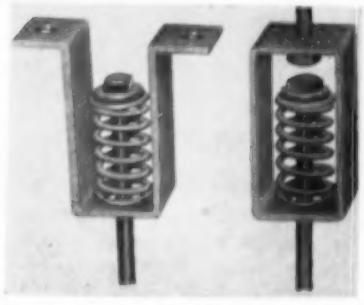
NOISE CONTROL DEVELOPMENTS

produce noise and vibrations. It is also useful for noise reduction in factories and offices. The unit is available in two models. The AP-1 has a fixed frequency range. Model LP-1 offers the same frequency range, but in addition has provisions for three linear scanning widths of 100, 500, and 1500 cps, allowing selection and magnification of narrow bands for detailed examination.

For details, use **Key # NC-2** on Inquiry Card on page 35.

VIBRATION HANGARS

A new line of high deflection, heavy duty vibration hangars, designed to prevent transmission of noise and vibration from suspended equipment and to support piping systems flexibly has been developed by



T. R. Finn & Company, Inc. Known as Finnflex Types S and SC Steel Spring Vibration Hangars, these units consist of a helical steel spring enclosed in a steel housing. Springs are manufactured of quality controlled MB, oil-tempered, carbon-steel wire with cadmium plating to prevent corrosion. They will withstand high temperatures without creep or permanent set, and low temperatures without increase in stiffness.

In both types, the suspended load is transferred to the isolating spring by means of rods or bolts with washers that rest on the bearing plates which enclose the isolating medium. The top bearing plate is capped with a rubber isolation washer to minimize noise transmission. At the bottom of the steel housing is a rubber damper washer to limit excursion at resonance. Both types are intended for use where large deflections are required due to thermal expansion of pipe lines, where high and low temperatures are involved, and where very low disturbing frequencies are encountered. Rated load capacities range from 50 to 1000 pounds.

For details, use **Key # NC-3** on Inquiry Card on page 35.

IMPROVED SOUND LEVEL METER

A new, improved model of the 410 Sound Level Meter has been announced by H. H. Scott, Inc. This new model, the 410-C, features a separate output stage for driving sound analyzers, peak noise indicators, graphic level recorders, and other accessory equipment. This makes unnecessary the switching off the 410 indicating meter movement to avoid introducing distortion caused by the rectifying action of the indicating meter. Circuit changes have also been made to improve the operating characteristics.

The 410-C is used for accurately measuring noise, sound and vibration from equipment such as blowers, ventilating fans, or aircraft and in industrial hygiene studies and acoustical surveys. The meter meets all specifications of the American Standards Association for Sound Level Meters. The sound level range is from 34–140 db above the standard ASA reference level of .0002 dynes per square centimeter. It uses readily obtained hearing-aid batteries with an operating life of about 50 hours and is available with a wide range of accessories, including vibration measuring equipment, acoustic calibrator and peak noise indicator.

For details, use **Key # NC-4** on Inquiry Card on page 35.

HEARING AID EYE GLASSES

Many persons afflicted with defective hearing have refused to purchase hearing aids because they consider ordinary hearing aids unsightly or clumsy. The development by Otarion, Inc. of a hearing aid that fits inside eyeglass frames has lead many of the hard of hearing to accept the electronic hearing aid. Known as The Listener, this eyeglass hearing aid weighs only 2½ oz.

The parts of The Listener fill 35 different cavities in a pair of specially designed eyeglass frames and temples. Prescription glasses or

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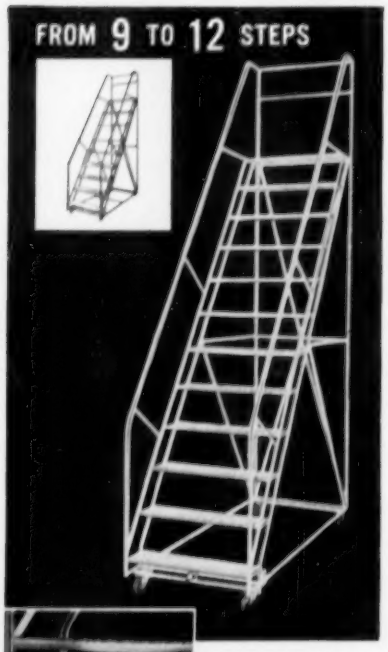

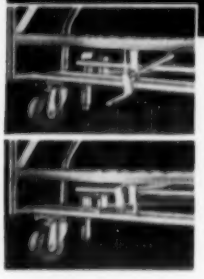

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(use key # T-15 on Inquiry Card on page 35)

plain lenses can be mounted in the frame. The circuitry and microphone fit into one of the "temples," while the battery, sound reproducer and four position switches are mounted in the other temple. Three wires run between the two temples through the frame. The hinges between the temples and the frame are the connectors for one wire. Two coin-silver contacts at each hinge are the connections for the other two wires, respectively. When the device is removed from the head and the temples closed in the normal manner, the four wiring contacts are opened and the power to the hearing aid is interrupted. The sound is carried from the sound reproducer through a short, hollow transparent plastic tube to a new type silicon rubber molded ear-piece.

The variation in patients' head size makes the fitting of The Listener a cooperative job for the audiologist and the optical man. Over 240 standard combinations are presently available.

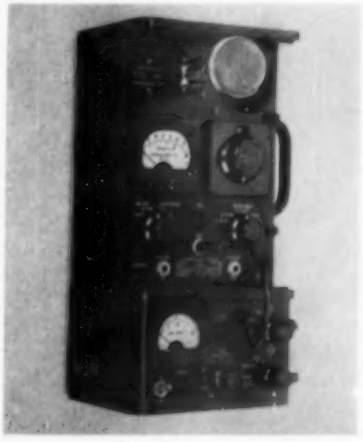
For details, use **Key # NC-5** on Inquiry Card on page 35.

HEAVY DUTY VIBRATION ISOLATOR

A new, high capacity vibration, shock and noise isolator which permits direct mounting of heaviest machinery without special chasses or foundations has been developed by the Korfund Company, and is being used successfully in the automotive industry. The SK/50,000 Vibro-Isolator, rated at 75,000 pounds for steady-running applications and 50,000 pounds for impact applications, is said to be the highest capacity isolator ever used.

These isolators consist of heavy-duty welded all-steel housings containing oil-tempered, high carbon or chrome-vanadium helical steel springs as the isolation medium. The upper and lower members of the housing are held in their relative position against lateral movement by resilient chocks which take up any horizontal thrust, and which can be adjusted for varying degrees of damping to limit vertical and horizontal oscillation under both vibration and impact. Two dual-purpose bolts in the top housing secure the mounting to the machine and provide a means for leveling the installation, thus eliminating the need for leveling jacks, shims, or wedges.

For details, use **Key # NC-6** on Inquiry Card on page 35.



IMPACT-NOISE ANALYZER

Impact noises such as those produced by large drop hammers present serious problems to industry. Measurements with sound-level meters and spectrum analyzers are inadequate for evaluating impact noise. Accordingly, a new instrument, the Type 1556-A Impact-Noise Analyzer, has been developed by the General Radio Co. to simplify measurements.

A study of the patterns of impact-noise oscillograms leads to the conclusion that two obvious quantities to describe impact sounds are the maximum instantaneous level and some measure of the time duration of the wave. These two values are readily measured by the new analyzer. The Impact-Noise Analyzer includes a self-contained bat-

tery power supply. The instrument is ordinarily operated from the output of a General Radio Type 1551-A Sound-Level Meter, or other suitable sound-level meter or spectrum analyzer.

For details, use **Key # NC-7** on Inquiry Card on page 35.

EAR PROTECTORS

Two models of an ear protective device are being made by United Cable Corp. One model of the Selectone insulates against all noise frequencies and is designed to counteract extremely loud noises where conversation is no longer possible. The second model is a low-pass filter and counteracts general noise while permitting the reception of ordinary communications by word of mouth, by telephone, or by sound signals.

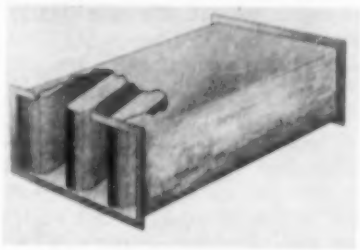
The protector is inserted in the auditory canal and can be easily removed at any time. The outer shell of the device is made of a relatively soft material that is comfortable. It is nearly invisible, stays in place, and is easy to clean. It is suitable for all types of noisy industrial plants, such as boiler factories, textile mills, sawmills, metallurgical plants, etc.

For details, use **Key # NC-8** on Inquiry Card on page 35.

AIR CONDITIONING SILENCING SYSTEM

An air conditioning silencing system, prefabricated in 148 sizes to meet every dimension and performance requirement, has been introduced by Industrial Acoustics Co., Inc.

Because of the large selection of available sizes, correct units for particular systems can be selected on the basis of the degree of noise reduction desired, pressure drop, and size of unit. The new silencing system has been given the designation Q-Duct. According to the manufacturer, a standard Q-Duct measuring in length from 2' to 10' will give as much attenuation as a conventional lined duct measuring from 30' to 100' long, depending upon frequency involved. Savings are therefore possible in both space and cost.



For details, use **Key # NC-9** on Inquiry Card on page 35.

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(Use Key # T-17 on Inquiry Card on page 35)

"Noise-Stop" acoustical baffles, which are rigid panels made of fine glass fibers and enclosed in an opaque plastic film. The sound-absorbing baffles, which are designed for suspension from the ceiling, are particularly suitable for areas where conventional acoustical ceilings are impractical because of obstructions like monorails, bus bars, sprinklers, lighting fixtures, pipes, girders, etc.

These non-combustible, washable, moisture-resistant and lightweight baffles absorb the noise of clattering machinery by a diaphragmatic transmission of the sound waves by the plastic covering to the tiny air pockets between the glass fibers. The panels may be painted without injurying the plastic film or affecting the baffles' efficiency. The units measure 24 x 48 x 1½ inches.

For details, use **Key # NC-10** on Inquiry Card on page 35.

SOUND-PROOF ROOM

Kittell-Lacy, Inc. has recently announced the development of a sound-proof room that can be used as a shop office, telephone room, etc. or for audiometric testing.

The new room is completely prefabricated, quick to assemble, and because of its modular construction, is readily expandable by adding pre-fabricated sections. There is ample room for two people; however, a phone jack is provided to enable tests to be conducted from the outside if desired. The room is well lighted and ventilated, and comes equipped with an adjustable table. Walls are constructed of special, laminated, metal-clad sound-proof material. Wall-to-wall carpet and a heavy pad cover the floor.

Inside, the room is 6'6" long, and 4' wide. It is shipped in sections and can be assembled by two men in less than four hours. It can also be furnished with a frame for moving by crane or fork-lift, or mounted on casters.

For details, use **Key # NC-11** on Inquiry Card on page 35.

SOUND METER AND ANALYZER

A new electronic instrument, said to be the first that combines in a single, portable unit four principal functions necessary to measure and analyze noise accurately, has been introduced by Mine Safety Appliances Co. Called the Soundscope, the instrument serves as a meter to measure overall sound levels. It also operates as an analyzer, measuring sound in each of eight octave bands to determine noise peaks. In addition, it can check sounds in narrower frequency bands. Electrical and acoustical calibrators are built into the unit.

To determine whether a noise hazard exists and to locate the sources are the functions of the new Soundscope. Circuits and instrumentation of the unit meet pertinent specifications of the American Standards Association for sound

level meters and analyzers. The entire instrument measures 16 inches long, 7¾ inches wide and 7 inches deep. It is enclosed in a wood and aluminum case that serves as a mechanical and electrical shield. All control dials are located on one panel and readings are indicated by a single meter.

When used as a sound level meter, the Soundscope picks up noise through its microphone which literally transforms sound

into electrical energy. The sound pressure level is measured by passing the electrical signal through attenuators and amplifiers to the meter. The reading appears on the meter calibrated in decibels (re .0002 microbar). Measurement range is from 24 decibels to 150 decibels. In the analyzer section of the instrument, noise is filtered into any of the eight principal octave bands, from 75 cycles to 19,200 cycles per second. Noise peaks in each of these bands then can be measured individually. For finer analysis, by frequencies within the octave bands, continuously variable filters are used.

For details, use **Key # NC-12** on Inquiry Card on page 35.

VIBRATION MONITOR

The Beta Corporation has announced a new mechanical malfunction detector that can be mounted on most types of rotating equipment to monitor vibration. The device is designed to actuate an alarm or cause shutdown when trouble occurs in the rotating or reciprocating equipment.

Encased in an oiltight housing, with external reset and locking device, the unit can detect malfunctions such as bearing roughness, imbalance, broken blades, bent shafts, etc. Its mechanism is said to require no maintenance, be fail-safe, and not depend on an external source of power. A wide range of internal adjustment of 0–2G's provides for a wide range of normal

vibration. Contacts are SPDT and rated at 5A, 115–230 V.A.C. resistive or inductive loads.

For details, use **Key # NC-13** on Inquiry Card on page 35.

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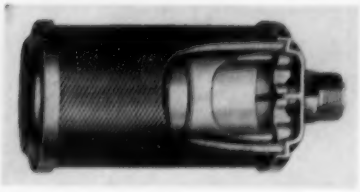
(For details, use Key # T-18 on card on page 35)

AIR EXHAUST MUFFLER

The Allied Witan Company has introduced an Atomuffler model engineered for better noise cancellation and easier installation. It features a new 4-port deflector which, combined with an internal acoustical resonator, is said to give uniform air dispersement with more effective impingment, resulting in better noise cancellation and improved air flow. The deflector disperses air outward in a lateral-radial pattern, reducing velocity to a minimum and, in turn, eliminating oil fog and water spray.

A newly engineered disseminator with improved air flow characteristics permits greater volume air flow, thus maintaining equipment operating efficiency. Quicker, more positive installation is possible with the new hex-head feature; installa-



tion can now be made with the use of an ordinary wrench. Double lock-tight construction resists vibration and holds fast under severe jolting. The new Atomuffler is available in sizes from ⅛" to 2" N.P.T.

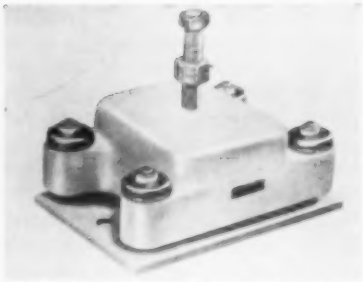
For details, use **Key # NC-14** on Inquiry Card on page 35.

VIBRATION MOUNTINGS

A new line of heavy-duty general purpose steel spring vibration mountings has been developed by T. R. Finn & Company, Inc., specialists in shock and vibration control. These "Finnflex" Type SB Steel Spring Vibration Mountings are said to combine the strength of steel springs with unique damping, sway and thrust control elements for an unusual degree of isolation. A cast semi-steel housing contains helical steel springs, rubber thrusts bumpers, nylon dampers, and a steel base plate with sway control assemblies. A dual-purpose bolt secures the mounting to the machine and also provides an easy means of leveling.

Nylon-lined, pre-compressed, cylindrical rubber bumpers absorb thrust in any horizontal direction. The nylon liners protect the rubber from abrasion and thus assure a constant degree of stiffness. Because of the low-friction characteristics of nylon, an unusually high degree of thrust control is obtained without any undue increase in vertical stiffness.

Optimum damping is also provided by the nylon liners which are pressed snugly around steel studs by the precompressed rubber thrust bumpers. All wear is taken up and proper adjustment is maintained automatically. This design provides stability without the need for external snubbing devices.



For details, use **Key # NC-15** on Inquiry Card on page 35.

FLEXIBLE EAR PLUG

A soft, flexible bullet-shaped ear plug which adjusts itself to the numerous variations in shape, as well as the movements of the ear canal, has been developed by Surgical Mechanical Research, Inc. Its thin walls, containing acoustic impeding materials, are balloon-like in character and mould themselves around high points and depressions in the ear canal.

Designated the Ear Stopper No. 506, it is available in four sizes; 7, 8, 9, and 10 millimeter diameters.

AIR OPERATED
LITTELL units
• SAVE MONEY
• SAVE FINGERS
• SAVE HANDS
• SAVE TIME
WITH dependable air operated safety units by Littell

Pres-Vac
SAFETY FEEDERS...
safely feed blanks to press from the safe distance of 14 inches —BY AIR!
Save those fingers.
$35.00

AIR BLAST VALVES...
eject parts safely with each stroke of the press—BY AIR!
Save those hands.
$29.00

NEWEST LITTELL UNIT
SHEET LIFTERS..
handle sheets of steel glass, plywood, boxes, cabinets, etc. Safely—
Save those Insurance Premiums.
$32.00

F. J. LITTELL MACHINE CO.
AIR DIVISION
4187 RAVENSWOOD AVENUE
CHICAGO 13, ILLINOIS
District Offices DETROIT and CLEVELAND

(For details, use Key # T-19 on card on page 35)

★ THE POSITIVE LADDER SAFETY DEVICE

It locks automatically—instantly—holds.
SAFETY DEVICE FOR LADDERS
Prevents death and injuries from falling.
Automatic: Positive. Will catch workman if he starts to fall even if unconscious.
Inexpensive. Easy to install. No upkeep. Clamps to any rung ladders, peg ladders, pole or frame. No welding or cutting.
Simple to operate: Requires no attention from climber.
Notched rail **hot dipped galvanized.** Entire equipment rust and corrosion proof.
In use throughout country and abroad for approx. 8 years.
Patented. Manufactured only by
SAFETY TOWER LADDER CO.
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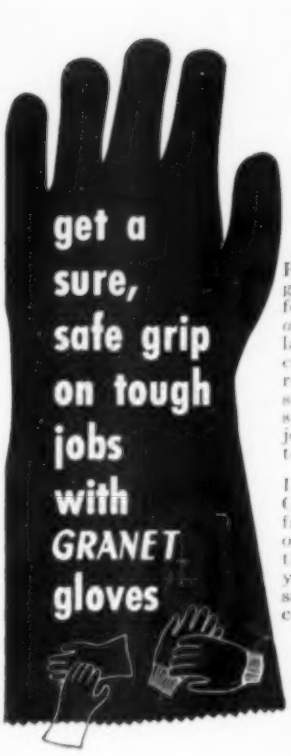
BURBANK, CALIFORNIA
★ ★ ★ ★ ★
(For details, use Key # T-20 on card on page



Put GRANET job-proven gloves to work in your plant, for complete hand protection *and* maximum wear per dollar. Palm coated or fully coated — with neoprene, rubber or plastic — for safe, sure grip. Types and styles specifically made for every job, from handling caustics to rough castings.

Immediate delivery of GRANET gloves is available from distributors throughout the country. To make the GRANET Wear Test in your own plant, write for sample gloves today, stating conditions of use.

GRANET

THE GRANET CORP.
29 LORING DRIVE
FRAMINGHAM, MASS.

(For details, use Key # T-21 on card on page 35)

MARTINDALE

FACE SHIELDS

Left Type S-15

Right Type J-1

These Martindale Face Shields are designed for use in metal finishing, wood working and other industrial plants.

S-15 is a heavy-duty shield with 16⅝" x 8½" visor. Simple adjustments provide perfect fit for all users. New visors can be quickly installed.

J-1 is a light weight, economically priced shield. Has eight simple hat size adjustments. Visor is 11" x 6"—fastens to deflector with 3 snaps.

Write for prices and complete information.
Ask for 64-page Catalog No. 30 of Items for Safety, Production and Maintenance.

MARTINDALE ELECTRIC CO.,
1397 HIRD AVE., CLEVELAND 7, OHIO

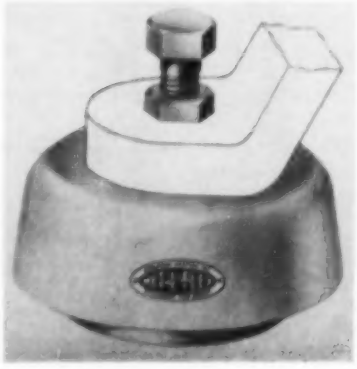
(For details, use Key # T-22 on card on page 35)

The plug is flanged to prevent the body from being pushed too deeply into the canal, and includes a small protruding handle for grasping the stopper when being removed. It can be cleaned with soap and water. According to the manufacturer, the plugs filter out loud noises, but permit the passage of voice tones, allowing the wearer to hear spoken directions.

For details, use **Key # NC-16** on Inquiry Card on page 35.

ADJUSTABLE MACHINERY MOUNT

Adjust-O-Mount, W339, a new, all-metal mount engineered for protection against vibration and the control of shock for such machines as presses, grinders, millers, lathes and many other machine tools, has been introduced by Robinson Aviation, Inc. The unit has a load carrying capacity, in three models, ranging from 1,000–10,000 lbs. per unit, without any necessity for change in the compact housing dimensions.



A lower natural frequency of 7–10 cycles per second makes absorption of vibration shock and noise so complete that punch presses and drop hammers may be located near offices or on upper floors, the manufacturer claims. Performance is said to be unaffected by oil, water, solvents, dust or extreme temperatures. A built-in leveling bolt and jam nut allows for quick installation on uneven floors. Maximum stability of the mounts eliminates the need for lagging the machine to the floor so that mobility becomes an added feature for modern production lines. The new mount may also be used in conjunction with inertia blocks for machines with high center of gravity. It measures $7\frac{11}{16}$" in diameter.

For details, use **Key # NC-17** on Inquiry Card on page 35.

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(from page 44)

manager indicated that the processes were becoming more and more automatic and that employees would ultimately be exposed to the high noise levels only 10 percent to 25 percent of their working time. The plant also carries out periodic audiometric tests on all personnel. Because of the anticipated low exposure time and the audiometric testing program, it was determined that a damage risk curve falling along the middle of the cross-hatched area of Fig. 2 could be applied to this problem. This criterion curve is plotted as the dotted curve in Fig. 4. Since the average noise levels throughout the plant are generally below the criterion levels, no noise reduction treatment was recommended for the plant.

CASE III—A division manager of a fabricating plant reported that approximately 50 shop and inspection personnel complained about the noise of an automatic punch press in a nearby production area. The range of noise levels measured at various positions about the complaint areas, approximately 50 ft to 80 ft from the punch press, are given in Fig. 5 for the punch press

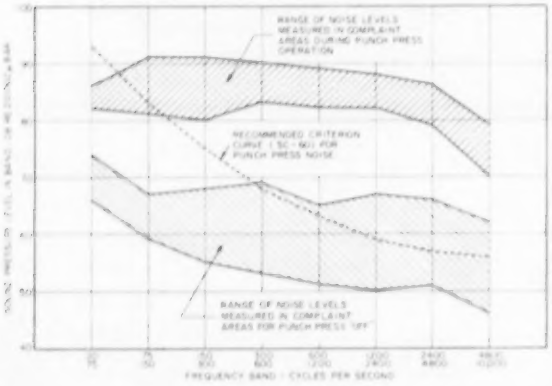
RANGE OF NOISE LEVELS MEASURED IN COMPLAINT AREAS DURING PUNCH PRESS OPERATION
RECOMMENDED CRITERION CURVE (SC-60) FOR PUNCH PRESS NOISE
RANGE OF NOISE LEVELS MEASURED IN COMPLAINT AREAS FOR PUNCH PRESS "OFF"
FREQUENCY BAND - CYCLES PER SECOND

Figure 5 Measured Noise Levels and Recommended Criterion for Shop and Inspection Areas of a Fabricating Plant (Case III)

"off" and "on." The nature of the work in the inspection area was such that the girl inspectors could perform their duties satisfactorily while chatting with each other. The operation of the punch press interfered with their conversation. The shop personnel were also annoyed by the noise but for no reasons associated with the need for speech communication. In order to permit the girls to talk and be heard, an SC-60 criterion curve was suggested. A lower SC curve would be of little additional value, because of the limiting background noise levels existing in the shop and inspection areas. The required noise level reduction was the difference, in decibels, between the upper curve of the upper cross-hatched area of Fig. 5 and the dotted curve corresponding to the SC-60 noise levels.

CASE IV—An aircraft manufacturing company plans to build an engineering building near its production test facilities where jet engines are tested. The nearly-continuous noise levels which exist at the building site are shown by the cross-hatched area in Fig. 6. The dotted curves in Fig. 6 represent the noise level criteria which have been accepted by the company

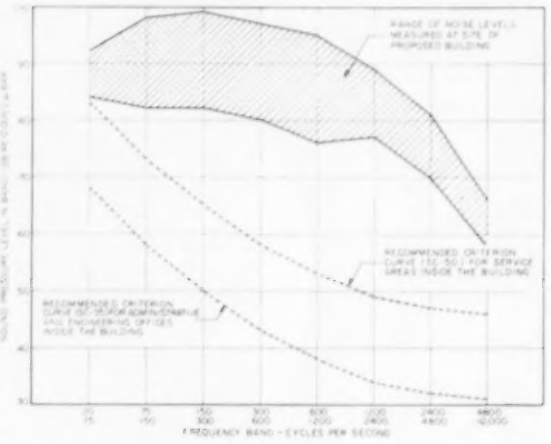
RANGE OF NOISE LEVELS MEASURED AT SITE OF PROPOSED BUILDING
RECOMMENDED CRITERION CURVE (SC-50) FOR SERVICE AREAS INSIDE THE BUILDING
RECOMMENDED CRITERION CURVE (SC-35) FOR ADMINISTRATIVE AND ENGINEERING OFFICES INSIDE THE BUILDING
FREQUENCY BAND - CYCLES PER SECOND

Figure 6 Measured Outside Noise Levels and Recommended Criteria for Noise Levels Inside a New Building for Aircraft Manufacturing Company (Case IV)

for administrative and engineering offices (SC-35 curve) and for service areas (SC-50 curve) inside the building. The building construction is designed to provide these criterion levels inside the building.

CASE V—A textile laboratory, complete with all types of textile machinery and processing equipment is being installed in the basement of an already constructed and occupied business office building of a textile company. It is desired by the company that the addition of the textile laboratory should result in no apparent change in the background noise of the business offices on the first floor. Some typical noise levels measured near several of the machines to be installed in the laboratory are shown in Fig. 7. Based on the

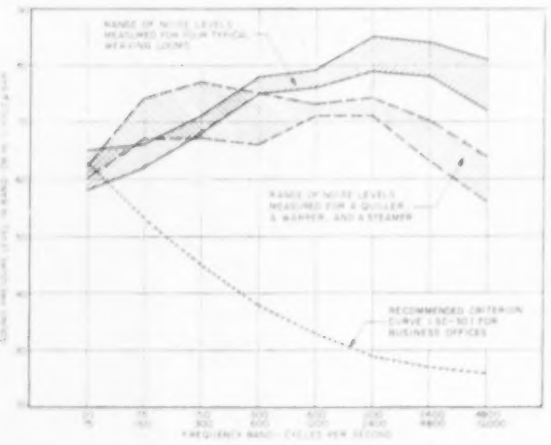
RANGE OF NOISE LEVELS MEASURED FOR FOUR TYPICAL WEAVING LOOMS
RANGE OF NOISE LEVELS MEASURED FOR A QUILLER, A WARPER, AND A STEAMER
RECOMMENDED CRITERION CURVE (SC-50) FOR BUSINESS OFFICES
FREQUENCY BAND - CYCLES PER SECOND

Figure 7 Measured Noise Levels in Textile Laboratory and Recommended Criterion for Office on Floor above Laboratory (Case V)

type of work performed in the first floor offices it was recommended that the textile noise not exceed SC-30 criterion levels in the offices. The approximate noise reduction required between the laboratory and the offices is the difference, in decibels, between the highest noise levels measured for the machinery and the criterion levels given by the dotted curve in Fig. 7.

CASE VI—A user of large quantities of coal unloads coal cars with a 20-HP mechanical shaker. The Safety Department of the company was concerned about possible hearing damage to the men working around the shaker. The noise levels measured at typical personnel positions during shaker operation are shown in Fig. 8. For this particular situation the measured

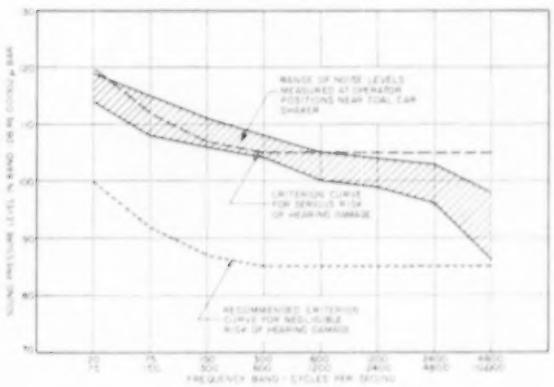

Figure 8 Measured Noise Levels and Hearing Damage Criteria for a Coal Car Shaker Operation (Case VI)

noise levels are seen to fall near the criterion curve for serious risk of hearing damage. On the basis of this condition the company decided to construct a small enclosure for the men when they were not actually required to be near the coal car or shaker. The dotted criterion curve for negligible risk of hearing damage was applied in designing the enclosure.

The six cases described above represent a reasonable cross-section of noise problems in business and industry. The examples are selected from various types of business offices, heavy industry, and the aircraft business, and even include a typical noise problem caused by an air conditioning system. The objections to the noise, and consequently the criteria applied to the solutions, involve speech communication, annoyance and hearing preservation. In the concluding article of this series next month a number of noise reduction techniques and noise control treatments will be described.

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Occupational Dermatitis

(from page 47)

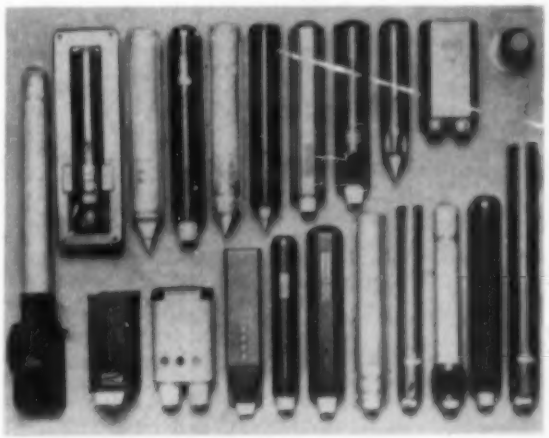
on by the patient during his non-working hours. All of these things have to be taken into consideration by the doctor. Of course, we all are conscious of the possibility of secondary infection which can prolong or polysensitize the dermatitis into an infectious eczematoid stage. Then there is the big reason that gets the dermatologist out of bed at night, that is the scratching and itching. Jacquet stated, "it is not the eruption which is itchy, but the itchiness which is eruptive." The itching produces scratching which gradually excoriates and then thickens the skin to a leathery stage which can be most resistant to dermatological treatment.

Then finally after the plant Safety Director and the Physician are at their wit's end, we bring in the psychiatrist. No, not for safety man or the doctor, but for the man with skin he has scratched through to the subconscious. Yes, that subconscious can even start at the surface of these bodies of ours. For there is the psychogenic factor that something can be gained by scratching and perpetuating the dermatitis.

The growing field of emotional experiences is vast in the complexities of modern life. Our attitudes are constantly altering with changes in discrimination, apprehension and understanding. Complex life situations in a world where nothing seems certain any longer are responsible for tensions that in certain individuals are more marked than in others, and in no two individuals necessarily the same.

In conclusion, I must stress that only through the highest degree of cooperation between the worker-patient, the safety director-management, and the industrial minded physician can a satisfactory solution be found for all concerned in occupational dermatitis.

From an address presented at the 26th Annual All-Ohio Safety Congress.



TAKE YOUR CHOICE—The growing use of paper cups at water fountains has brought on the market a wide variety of sanitary dispensers. With holders available in single and double cylinders, "in-the-wall," "pop-out" and even "penny in the slot" types, in both metal and plastics, water cooler users find it a far cry from the war years when all too often cups were simply piled on top of the water bottle. Pictures here are examples of 21 of the popular models now in use for wedge, cone or flat bottom cups. Many of these come in additional sizes or a variety of colors.
Paper Cup & Container Institute

MINE SAFETY APPLIANCES CO. has opened a new office and warehouse at 2500—12th Avenue, North, Birmingham 4, Alabama to provide improved service for customers in Alabama and Western Florida. A complete line of protective appliances and replacement parts and supplies will be stocked at the warehouse to serve the area's expanding industrial needs.

THE JOHN B. MOORE CORP. of Nutley, N. J., manufacturer of solvents engineered for safety, has recently appointed Irving Q. Sarlin as president. Mr. Sarlin joined Moore in 1952 as a sales engineer in the New York territory and in 1953 he became process engineer in the main office in Nutley, advancing to general manager early in 1955. John B. Moore, founder of the company, will become technical director and devote his full time to research and new products.

COPPUS ENGINEERING CORP., Worcester, Mass., has acquired from the McRae Corporation, Glendale, California, exclusive manufacturing and sales rights of their Sentry Valves, it has been announced by Jerome George, Jr., president of Coppus. The valves are patented automatic quick-closing latch type valves and quick-opening piston valves. Coppus becomes owner of the trademark, "Sentry." The new line augments its service in the power plant, petroleum and chemical fields where Coppus products have become well established.

(Use Key # Y-24 on Inquiry Card on page 35)

Forrest L. Fraser

AMERICAN OPTICAL COMPANY has announced the appointment of *Forrest L. Fraser*, nationally-known sales executive, as Vice President for Marketing.

E. Weldon Schumacher, President, said Mr. Fraser will be responsible for directing and co-ordinating all sales, sales promotion, merchandising and advertising efforts for American Optical, a leading supplier of optical, ophthalmic and protective clothing products. He will have his offices at the company headquarters in Southbridge, Mass. Mr. Fraser has for 25 years been identified with merchandising and marketing at the national level.

FENWAL, INC. has appointed Thomas H. Closs Company to represent the company in eastern Maryland, the northern counties of Virginia and the District of Columbia. He will handle the complete line of precision temperature controllers, as well as fire and overheat detection devices. The sales office is located at 21 West Pennsylvania Avenue, Towson 4, Maryland.

D. W. Tyrrell, President and Board Chairman of the *RAY-O-VAC COMPANY* announced that *WILLSON PRODUCTS, INCORPORATED* has been merged with the parent organization. The merger was effective April 1, 1956.

Purchased in 1955, Willson was operated as a separate but wholly owned subsidiary of Ray-O-Vac. The new division will be known as *Willson Products Division, Ray-O-Vac Company.*

MACWHYTE COMPANY, Wire Rope Manufacturer, has a new office and warehouse in Detroit to provide additional facilities for service with a large factory stock.

Located at 75 Oakman Boulevard, complete handling and cutting facilities have been installed for quick pick up and delivery of a wide range of sizes and types of wire rope used in the Detroit area. This factory stock is supplementary to stocks and services by Macwhyte Company distributors and has been established to give factory service to Macwhyte Company distributors and their customers.

Herbert W. Heinrich has been elected chairman of the Uniform Boiler and Pressure Vessel Laws Society, Inc., and has assumed his new post June 1. He succeeds William Ferguson who is retiring after serving in this office for 10 years.

The Society is a non-profit association concerned with the safe design, construction, installation and inspection of steam boilers and pressure vessels in the United States and Canada. The organization has recently completed working arrangements with all important industrial nations on every continent to accept boilers and pressure vessels built in accordance with the A.S.M.E. codes.

Mr. Heinrich is internationally recognized as a safety engineer. Mr. Heinrich had served The Travelers Insurance Companies for 43 years, retiring last April 30 as superintendent of the engineering and loss control division.

THE PYRENE-C-O-TWO DIVISION of Newark, N. J., has announced the appointment of *W. E. Tromanhauser* as vice president and general sales manager. Tromanhauser leaves the position of president of the Buffalo Fire Appliance Corporation of Dayton, Ohio, to join Pyrene. He will remain a director of Buffalo.

Levan R. Fleck, Manager of Safety for Ethyl Corporation, died May 12 while attending a meeting of Ethyl Corporation safety engineers. He was 46 years old.

Mr. Fleck joined Ethyl Corporation in 1937 as a field representative in the company's Baltimore division. The next year he received his first safety assignment and the following year was assigned to full-time safety work in Dallas, Texas. In 1940, he was transferred to Tulsa, Oklahoma as chief safety engineer.

During World War II he served in the U. S. Army for five years, attaining the rank of major. He participated in campaigns from Normandy to the Elbe River with an anti-aircraft artillery unit, and received the Bronze Star decoration at the time of the Rhine River crossing.

Soon after his return from army service in 1946, he was transferred to the safety department of Ethyl's New York office. He was named assistant safety manager in 1950, and manager of safety in 1952.

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To obtain descriptive literature of products listed, use Reader's Inquiry Card. Write in code number given each item. Send written requests to: Service Dept., SAFETY MAINTENANCE.

what's new for JULY

ACRILAN WORK CLOTHES

(Use Key # 865 on Inquiry Card on page 35)

ACRILAN, a new synthetic fiber made from natural gas and air by the Chemstrand Corp. is being used in the manufacture of fabric for work clothes. A blend of the new fiber and combed cotton (50 percent Acrilan and 50 per cent cotton) is being produced by Burlington Mills under the name Acri-Chino.

The fabric is resistant to acids and, according to the manufacturer, will show little effect, if any, from the most biting acids and chemicals. Soft and comfortable, the rugged, long-wearing material is said to retain its shape through wearing and washing. In the picture, the overalls at left are made of Acri-Chino, while those on the right are of cotton. Both uniforms have been exposed to the same chemicals and washings. When washed, it dries quickly, requiring infrequent ironing. Shrinkage is less than one percent. Work clothes of the new fabric are available in the form of shirts, pants, overalls, and jackets from the following manufacturers: Smith Bros. Mfg. Co.; Hartwell Garment Mfg. Co.; Topps Mfg. Co.; Wirk Garment Div., Clarence Whitman & Sons, Inc.; Pool Mfg. Co.; Hart Mfg. Co.; Washington Mfg. Co., Inc.

SKIN CREAM FOR DERMATITIS

(Use Key # 866 on Inquiry Card on page 35)

A NEW skin cream for hand dermatitis, combining the effectiveness of its acidifying action with the healing and soothing properties of a buffered solution of aluminum acetate in a desirable oil in water emulsion type ointment base, has been developed by Dome Chemicals, Inc.

Known as Acid Mantle Creme, it is a therapeutic aid for infected skin areas, as well as a protective cream for healthy skin. According to the manufacturer, the protective acid condition of the skin must be maintained to prohibit the incidence of skin disorders. Used as a preventive after washing, the cream quickly restores the natural acid mantle of the skin, maintaining the normal pH.

NON-SLIP GLOVES

(Use Key # 867 on Inquiry Card on page 35)

A NEW line of rubber coated industrial gloves called Grip-all, that have an impregnated extra-coarse rubber dust surface, making them highly resistant to slipping, is being introduced by Hood Rubber Company, a division of The B. F. Goodrich Company.

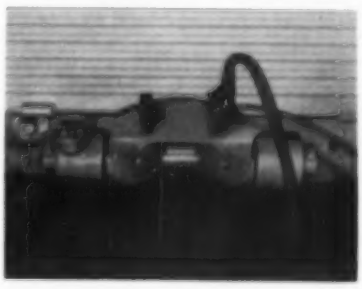
The new line of Grip-all gloves is heavyweight for long wear and protection, yet remains completely flexible to allow free finger movement and enable workmen to grip hard and fast. Hood's new Grip-all gloves are designed for workmen handling sharp, slippery objects such as plate glass, sheet metal, etc., and have been tested in glassmaking plants. The gloves are available in five different styles. They include palm and fully-coated styles with knit wrists and 2" and 4" safety cuffs. In the photograph are shown (left to right): palm-coated, 2" band safety cuff with elastic strap (R-58); palm-coated, knit wrist (R-55) or fully coated knit wrist (R-56); palm-coated, 4" safety cuff with elastic strap and knuckle protection (R-60); and palm-coated, 2" band safety cuff (R-54).

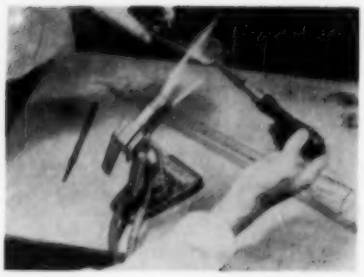
TRAILER COUPLING LOCK

(Use Key # 868 on Inquiry Card on page 35)

RELIABLE statistics point up the fact that 90 percent of all accidents involving trucks and trailers are caused by human errors or omissions, with less than 10 percent resulting from mechanical failures. The Torre 5th Wheel Safety Lock, designed and engineered by the Automotive Division of Pioneer Tool Engineering, Inc., is said to remove much of the incidence of human error by making accidental separations of tractor and trailer virtually impossible.

The Safety Lock is adaptable to any make of fifth wheel equipment and is not dependent upon the driver's remembering to operate it. The device is simple, with only two moving parts. Its safety piston, dropping into position automatically, securely locks the tractor to the trailer as the driver opens the air valve. In addition, the Safety Lock prevents breaking of air hose, light cables and other connecting items, thus reducing large costs in equipment and maintenance labor.





LABORATORY BLAST-BURNER

(Use Key # 869 on Inquiry Card on page 35)

AN ACCIDENT-proof, completely noiseless blast-burner, with a large range of flame sizes and temperatures at the flick of a single hand, has been produced by the Fisher Scientific Co. The new burner works Pyrex-brand glass up to 75mm in diameter easily; also Vycor-brand glass up to 25mm, and even quarts. It is equally useful for crucible ignitions, ore fusions, and coke button tests.

Among the features of the MultiFlame Burner are: multiflame design (lets you select any number of flame sizes and temperatures by manipulating valves on the burner body); silent operation; safety (external mixing of gases means no combustion in the burner body, no danger of backflash when large flames are used); cool operation (since all burning occurs in the front of the burner tip, valves stay cool, easy to handle); fingertip control. (Only two control valves to handle means faster changing of flame sizes—and you can adjust the gas or oxygen in any sequence); pilot flame (keeps burner always ready for use; pilot-flame size controllable, too). The burner can be used with any gas, and at normal gas pressures. Oxygen pressure is not critical. It can range from 5 to 10 psi.

LIFE PRESERVER

(Use Key # 870 on Inquiry Card on page 35)

A LIFE preserver vest, said to be different in design and performance, is now being produced by Safety First Supply Company. The Quick Release Life Preserver Vest is designed so that it will float the wearer in a vertical position, regardless of his body weight, so that his head and shoulders are above water level. The front pads of the vest raise up in the water to catch under the wearer's chin and the back pad of the vest raises to support the back of the head out of the water.

The vest is equipped with a snap at the bottom front which is to be attached to the man's belt or belt loop, so that it cannot float off the wearer. However the fasteners and the snap are attached to the vest with an aluminum rod, and if the wearer becomes trapped under a barge, between two objects, etc., and must be rid of the life vest to escape, he merely pulls upward on a lace attached to the rod, which draws out the rod and completely disengages all fasteners, so that the vest can then be easily removed. Maximum thickness of the vest at any point is 1¼ inches. It comes in one size that is easily adjustable by side straps to fit chest measurements from 30 to 56 inches, inclusive. The buoyant material in the life preserver is of a closed cell, expanded vinyl plastic that is unaffected by most oils, acids, or perspiration. It will not sustain a flame. Maximum absorption after 72 hours submergence is less than one per cent. It has a buoyancy factor of 16 pounds above water level before submergence. After it has been submerged for 24 hours, the buoyancy factor is 12¾ pounds above water level when saturation has reached its maximum, and there is no change in the buoyancy factor at the end of 72 hours submergence. The K factor is .20–.25. The vest cloth is available in two colors—bright orange or forest green. Scotchlite patches are standard. The entire vest can be laundered just like other work clothes.

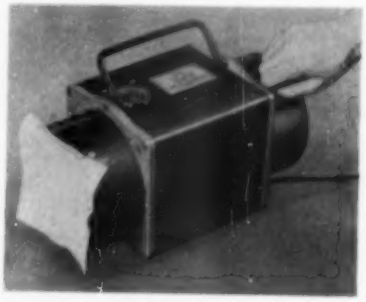
VEHICLE STEERING AID

(Use Key # 871 on Inquiry Card on page 35)

THE KOSCH Mfg. Co. has developed a new steering aid for materials handling vehicles. The unit is a combination steering wheel and automatic clutching device. Chances of accident to operators of industrial trucks and tractors, lift trucks, and other vehicles with small turn wheels are lessened because of the "no kick-back" feature of this steering device. The working mechanism in the hub assembly eliminates all shock and "kick-back" that frequently catches an operator unaware and breaks a bone or severely bruises a wrist or hand.

Designated Steering-Aid, it is said to hold the steering gear stationary, no matter how much "kick-back" the guide wheels get from hitting bumps, obstacles on the floor, stacks, or building columns. It turns the wheels but the obstacles can't. The unit automatically releases when the steering wheel is turned, so normal steering results. Another practical advantage is that the steering aid functions as an "automatic pilot" on the vehicle, holding it on course even over bumps and obstacles, and without the operator holding the wheel.

The unit is self-contained and has no costly hydraulic or electrical mechanism. Is permanently lubricated and sealed for life. Farm tractor owners have used this steering aid successfully in the several years a farm model has been available.

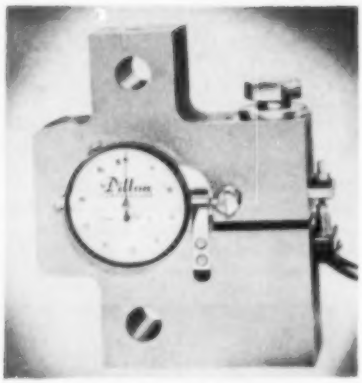


AIR SAMPLER

(Use Key # 872 on Inquiry Card on page 35)

A NEW type of instrument which enables precise measurement of airborne contaminants taken from large samples of air has been developed by the Mine Safety Appliances Company. The instrument is used to collect these contaminants to be weighed and analyzed in connection with industrial hygiene or air pollution problems.

Feature of the new instrument, known as the M-S-A Fixt-Flo air sampler, is an automatic flow control which compensates for changes of filter resistance caused by collected material. This is an important factor in achieving high accuracy in determining the volume of large samples of air. Automatic control of air flow rate is provided by a compensating damper in a by-pass duct for unfiltered air. Filtered air enters a plenum chamber and passes through a fixed orifice in a spring-loaded diaphragm plate. As filter resistance increases, pressure in the plenum chamber decreases, thus releasing the diaphragm plate to close a switch that starts the by-pass damper motor. The damper reduces the by-pass air flow, thereby increasing suction through the filter. Changes in supply voltage also cause damper operation to increase or decrease by-passed air flow and thus maintain constant air flow volume through the filter. The Fixt-Flo sampler is a rugged instrument that is easy to operate with no gauges to watch and no adjustments. A wide variety of filter media can be used without knowledge of their specific resistances. Filters can be cut from bulk material. Any of three flow rates may be selected by the user: 15, 30, and 50 cu. ft. per minute. The sampler is small: 7¼ x 7¼ x 15 inches, and light in weight: 13½ pounds. It operates from 110-volt, 60-cycle power supply.

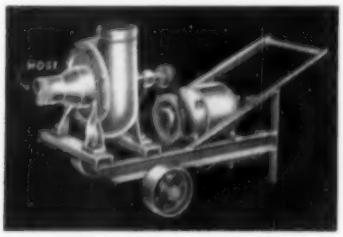


50,000 LB. FORCE GAUGE

(Use Key # 873 on Inquiry Card on page 35)

W. C. DILLON & Co. is now producing an 0-50,000 lb. version of their force gauge, suitable for a wide variety of testing applications hitherto impractical because of the high range required. This instrument is available for either compressive or tensile tests and has a warranted accurracy of within 1 percent of the indicated reading. The new 50,000 lb. model is an extremely compact instrument and is excellent for conducting tests where space is at a premium. Dimensions of the compression model are: height 5½"; thickness (including dial indicator) 3½"; width 8"; with a net weight of only 30 pounds. Tensile model dimensions are: height 10"; thickness 3½" (including dial indicator); width 8"; with a net weight of 37 lbs.

A safety stop-bolt prevents undue expansion of open end of gauge. Accidental overloads beyond the gauge's normal 25 percent safety factor merely cause the upper portion of the gauge to come to a positive stop against the bolt head, thereby providing a safety factor in excess of the rated capacity.



PORTABLE FUME COLLECTOR

(Use Key # 874 on Inquiry Card on page 35)

MANUFACTURED by the Ruemelin Mfg. Co., this fume collector is designed to gather welding fumes, smoke, and gas from tank interiors and other inaccessible areas. Because the unit is portable, adequate fume removal is possible wherever welding operations are performed.

Designated the No. 2660, the unit is mounted on a car type platform with 8-inch diameter rubber tired wheels. The collector handles up to 35 ft. of 4-inch flexible metal hose, and is complete with fan and a 1½-h.p. motor.

REMOVABLE MARKING PAINT

(Use Key # 875 on Inquiry Card on page 35)

TEMLINE, a temporary and completely removable paint product, has been made available by the Traffic Safety Supply Co. The new paint is designed to serve in emergencies where lines are necessary, but of short duration.

The removal of ordinary paint lines used in emergencies has long been a problem. Temline paint, available in white or yellow, can be brushed or sprayed on with ordinary equipment. Permanent lines can be painted out with a neutral gray Temline. The paint dries in less than half an hour, and is not affected by water. Under normal traffic, the paint will last many months. When the emergency is over, all temporary lines can be removed completely, and original lines restored, with the use of R-14 remover. This remover dissolves only Temline paint, and in about fifteen minutes.

NEW GLOVE LINE

(Use Key # 876 on Inquiry Card on page 35)

A COMPLETELY new work glove line, flexible enough to meet virtually any industrial hand protection need, is now being produced by the Pioneer Rubber Company. Called Pacemakers, the new line incorporates 15 design innovations.

Each glove in the Pacemaker line is made of neoprene coated flannel in three different weights: light, industrial and heavy duty. In addition, there is a choice of knit wrist and 12-, 14½-, and 18-inch gauntlet styles. Of special interest is the heavy duty "Hot 'N Cold" glove, which features two 8-ounce shells, face-to-face napping for extra insulation, double-napped inner lining, bar-tacked fingertips and non-ravel locksmith binding on gauntlet. Light and industrial weight Pacemakers are available in black, heavy duty in mahogany red with non-slip finish on palms and fingers.

Suggested uses for Pacemakers include jobs where resistance to extreme abrasion and chemicals is important; jobs where gloves will encounter acids, caustics, solvents, greases or oils; the handling of lumber, wood, concrete, tile, and clay products; and for handling metals during forming, punching, shearing, grinding, pickling, plating, painting, warehousing, and shipping.

SAFETY SPECTACLES CAN BE ATTRACTIVE

(Use Key # 877 on Inquiry Card on page 35)

EYE SAFETY can be combined with comfort and modern style, according to United States Safety Service Co., manufacturers of the new all-plastic SAF-I-SPECTACLES. Strong Butyrate frames are available in choice of modern colors, with different Styl-Ize lens shapes for both men and women. Lenses can be supplied either in hardened safety glass or shatterproof Optilite, characterized by the manufacturer as "not a glass, not a thermoplastic, but an exclusive formula of compounded resins —twice the strength but only half the weight of hardened safety glass." This product is also claimed to have characteristics of light transmission, fog and pitting resistance superior to other types of lenses.

Optilite can be supplied either in plane or prescription lenses, including bifocals for workers whose eyes need correction. Thus, about 60 percent of those over 40 years of age can wear one pair for both eye correction and protection. Popularity of this type of safety eyewear and its increasing acceptance by industry can be based upon smart appearance and comfort. However to make positive identification easier, small green safety crosses are used on each temple to distinguish the U3SSCO spectacles as high style safety eyewear, which meets strictest Federal specifications.

APPLICATOR BOTTLE

(Use Key # 878 on Inquiry Card on page 35)

A NEW capillary type antiseptic applicator bottle for use in general skin disinfecting has been introduced into the unit type industrial first aid market by the Medical Supply Co.

The new bottle, due to its construction, will withstand impact pressures up to twice the amount of the old type bottles in cardboard sleeves. These applicators, both 3½cc and 10cc, will withstand five times the compressive breaking value of the old type and up to twice the amount of internal pressure as proven by laboratory tests. Printing is applied directly to the bottle to allow instant identification of the contents.

DRUM UPENDER

(Use Key # 879 on Inquiry Card on page 35)

LESS physical effort is needed to upend loaded oil or chemical drums safely using the newly developed Drum Upender #32, manufactured by the Morse Mfg. Co. The new drum upender has a 40" handle, offset 35 degrees for maximum efficiency in raising drums from horizontal to vertical. A hefty 1¼" hook provides adequate clearance for the largest chime. A 2½" x 8" toe plate spreads lifting pressure over a large area to prevent drum damage.

The tool, engineered for manually upending heavy drums with a minimum of effort speeds production, makes drum handling a fast, one-man operation. It cuts lost manhours due to personal injuries while handling heavy drums. Strong and durable, the tool is designed for long service.

VITAMIN CAPSULES

(Use Key # 880 on Inquiry Card on page 35)

EAST VITAMIN Products announces the availability of multi-vitamin capsules in bulk quantities. They are designed specifically for on the job distribution to industrial employees as a management service, in the interests of the worker's good health as well as to reduce absenteeism.

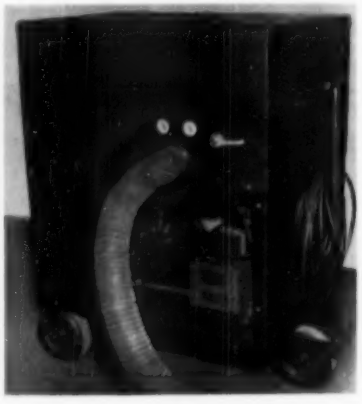
A supplement to necessary vitamins in the daily diet, they help to keep workers fit, and capable of resisting colds, minor ailments, and fatigue. The daily dosage of one capsule contains 10 of the most essential vitamins, including vital B Complex.

NON-ADHERENT SURGICAL DRESSING

(Use Key # 881 on Inquiry Card on page 35)

THE FIRST non-adherent, completely absorbent surgical dressing in the history of medicine, the Telfa Non-Adherent Dressing, is now available for industrial first aid use in the Davis D-Carton Unit System of first aid announces the Davis Emergency Equipment Company, Inc.

The new dressing will not stick to wounds or burns, and keeps them entirely dry. It consists of a pad of highly absorbent, non-woven cotton material with a thin coating of finely perforated plastic bonded to it. Discharge from the wound passes through the perforations and is absorbed by the cotton material. The discharge cannot flow back into the wound, as the perforations function as "one-way valves." Telfa Non-Adherent Dressings, a name registered by the Kendall Company, can be removed from the wound without soaking, without pain, and without rupturing the healed surfaces. The dressings are available in the Davis D-Carton Unit System in the form of 2" and 4" bandage compresses, and as an 8" x 10" compress, all packaged in easy-to-open, sanitary wrap with red pull-tab.



PORTABLE COOLING UNIT

(Use Key # 882 on Inquiry Card on page 35)

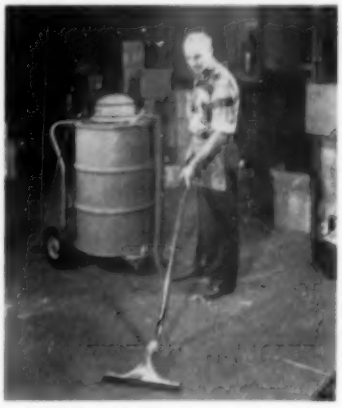
PRODUCTION of a portable air cooling unit for industrial use has been announced by the Peuchen Engineering Corporation. Known as the Breeze Wagon, the unit is designed to reduce quickly temperatures in hot, confined areas such as tanks, vats, ovens, etc., thereby enabling maintenance work to be undertaken safely, more quickly, and efficiently.

Depending upon the size of the unit, the manufacturer claims it is possible to provide a refrigeration capacity of as much as 60,000 B.T.U.'s per hour, giving a temperature reduction from 30 to 40 degrees. A unit is said to pump 500 to 1,000 cubic feet of refrigerated air into a confined area in the span of a minute. Mounted on a four-wheeled steel cart with pneumatic tires, the "Breeze Wagon" is a completely mobile unit which can be easily moved from one plant location to another.

NEW VACUUM LINE

(Use Key # 883 on Inquiry Card on page 35)

A NEW line of vacuums, with every model offering all-job versatility, is announced by American Floor Surfacing Machine Co. These new vacs are available in eight different models, 3, 9, 12, 9/12 and 55 gallon capacities, and are designed to perform cleaning assignments with speed and efficiency. They are said to meet the daily maintenance needs of every type of user, whether wet or dry pick-up on



large or small areas, and from floors to rugs to off-floor jobs.

The machines can also be used to remove dust and dirt from venetian blinds, draperies, radiators, pipes, coils, walls, ceilings, even furnaces, etc., quickly and efficiently. In cases where a special dust problem is created by manufacturing operations, highway traffic, smoke or other causes, these vacuums are handy for a quick clean-up. In common daily emergencies, these vacs also help to restore cleanliness and order promptly; if a water pipe should leak; if entrance halls get sloppy due to snow, rain, slush; if packages of powders, flakes or granules should break or spill. Specifications for the new line of American all-purpose vacuums include: *Horsepower:* from ⅜ to 1½ H.P. *Motors:* by-pass, ventilated or external bag type. *Tanks:* blue or white enamel or porcelanized finish; also stainless steel. *Wheels:* free-wheeling 4-caster base plate, push or pull type dollies with tool baskets. *Hoses:* from 1¼" to 2". Choice of rubber, neoprene or stretch-type.

REFLECTING PAINT KIT

(Use Key # 884 on Inquiry Card on page 35)

A KIT containing "Codit" reflective liquid (No. 7210), has been announced by Minnesota Mining and Mfg. Co.

The portable kit contains enough of the fast-drying liquid to reflectorize 2,200 feet of alternate color curb marking; or 400 square feet of obstruction markings; or 100 12-foot-by-8-inch barricades, the company said.

"Codit" reflective liquid was recently developed by the 3M company for reflectorization of traffic hazards and other objects made of wood, concrete or other rough or

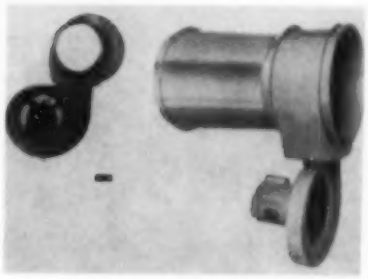
porous surfaces, such as median dividers, underpass abutments, walls, etc. During the day it is light gray and blends with concrete or other light-colored objects. But at night under auto headlights it reflects back to the driver in bright silver, 50 times brighter than white paint. A 6-by-8-inch application is identifiable as a hazard about 1,000 feet away under high beam headlights, the company claims. The kit includes: three 4-pound cans of reflective liquid; four 6-ounce spray cans of reflective liquid; 20 stencils for reflectorization of curbs and barricades; a wire brush for cleaning the surface to be reflectorized; two 60-yard rolls of masking tape; a 4-inch wide paint brush; a quart of brush cleaner; a measuring utensil; a stirring paddle; and a set of marking plans. An application of the reflective liquid will last about one year, the company reports, depending upon the surface to which it is applied and weather extremes.

PRESSURIZED GRAPHITE LUBRICANT

(Use Key # 885 on Inquiry Card on page 35)

SPRAY GRAPH, an instant drying, long lasting graphite lubricant is now available in 6 oz. spray containers. Manufactured by American Resin Corporation, the new spray can be successfully applied to both metallic and non-metallic surfaces.

Application of Spray Graph is said to increase the life of moving parts, step up efficient operation and reduce maintenance costs. There is no surface build-up or drippage of the lubricant. It provides effective lubrication at temperatures ranging from 100 degrees below zero to 800 degree F. It does not pick up lint, dust or dirt. Oxidation, corrosion and friction are greatly reduced and "sticking" is prevented. Spray Graph's physical qualities plus the self-spray method of application permits lubrication of odd sizes and shapes of material as well as surfaces in hard-to-reach locations.

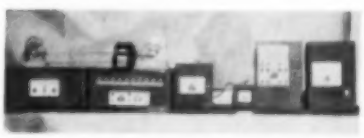


HEAVY-DUTY EXHAUSTERS

(Use Key # 886 on Inquiry Card on page 35)

NEW standard and heavy-duty commercial power exhausters, developed for handling industrial venting applications and commercial heating plants without exposing fan blades and motors to exhaust gases, have been announced as additions to its line of residential power draft units by the Quickdraft Co. Mounted outside the exhaust units, the fans and motors run in clean room air, or in ducts that supply clean outside air. Quickdraft is designed to direct injected air into a conical jet that "pulls" exhaust gases into the unit and "forces" them into the atmosphere.

Because fans and motors are not exposed to abrasives, corrosive gases, smoke, noxious fumes, high temperatures, moisture and steam, maintenance costs are materially reduced. Downtime, commonly required for cleaning and replacing blades when fans are mounted in exhaust lines, is eliminated. Even in the event of power failure, vent lines are not obstructed by idle fan blades or motors. The new exhausters do not require a stack for either industrial venting or heating plant installations. Units are built in eight sizes for vent diameters of 12, 14, 16, 18, 20, 22, 24 and 30 inches. For exhausting direct to atmosphere or into standard stacks and chimneys, capacities range from 141,600 to 877,000 cubic feet per hour. Special exhausters can be made for handling greater capacities.

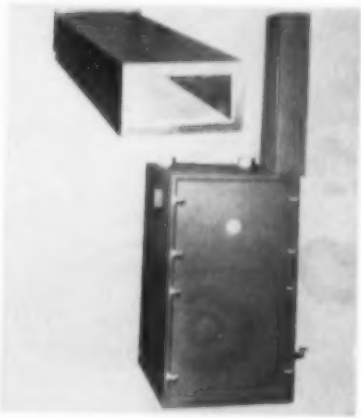


AUTOMATIC FIRE ALARM SYSTEM

(Use Key # 887 on Inquiry Card on page 35)

A FULLY automatic fire detection and sprinkler supervisory system without mechanical code transmission has been developed by the Notifier Mfg. Co. and granted a Class A rating. It can be designed for industrial, commercial and institutional use and is said to exceed the requirements of the NBFU. All the elements of the system are listed by Underwriters' Laboratories and most of them by Factory Mutual.

The primary parts of the system include: the power supply unit; control panel and annunciator, available in up to 80 circuits and locations for each power unit; emergency signaling actuator; emergency signaling receiver and a remote station receiving panel; automatic code translator with memory retention; punch register and time stamp. The system can be used with thermostats to form an automatic fire detection and alarm system; or it can be connected to sprinkler controls for a sprinkler supervisory system; or a combination of the two. Audible signals are used on the immediate premises while notifications of fire, water flow, or trouble signals are transmitted instantly to the receiving center or fire station.



DUST COLLECTOR SILENCER

(Use Key # 888 on Inquiry Card on page 35)

INTENDED for use wherever "extra" quiet operation is desired on Torit cabinet-type dust collectors is the new Exhaust Silencer, a product of Torit Manufacturing Co. The silencer is available in five models to fit the exhaust openings on the 50, 60, 70 and 80 series and the Model 122 collectors.

Although all Torit dust collectors are designed to run quietly, some applications require even greater noise suppression for employee comfort and operating efficiency. The three smaller models are made of 20-gauge steel and extend 30" above the top of the collector to further reduce the noise effect; the two larger models are built of 16-gauge steel and extend 36". All five are rectangular in cross-section and are interlined with 1" closed cellular vinyl foam that is said to absorb approximately 80 per cent of the noise without restricting air flow. All silencers are given a baked-on wrinkle finish to match the Torit cabinets. They can be readily attached to new Torit units at the factory or to collectors now in use.

YOUR FREE INQUIRY CARD—Page 35

Index to Advertisers and their Agencies

Ballymore Co., The	50	The Eldridge Company, Philadelphia
Bullard Co., E. D.	8	Wank-Lougee-McDonald & Lee, San Francisco
Charleston Rubber Co.	47	Advertising Service Agency, Charleston
Cover, H. S.	26	Jerry Bryant Advertising, Chicago
Davis Emergency Equipment Co., Inc.	20	Williams and London, Newark
Granet Corp., The	55	Meissner & Culver, Inc., Boston
Herman Hosmer Scott, Inc.	44	Engineered Advertising, Boston
Hood Rubber Co.	41	Henry A. Loudon Advertising, Inc., Boston
Hynson, Westcott & Dunning, Inc.	Back Cover	
Junkin Safety Appliance Co.	25	Farson, Huff & Northlich, Louisville
Legge Co., Inc., Walter G.	6	J. M. Kesslinger & Associates, Newark
F. J. Littell Machine Co.	54	Vernon S. Weller Advertising, Chicago
Martindale Electric Co.	55	Kenneth H. Kolpien Advertising, Cleveland
Mine Safety Appliances Co.	Inside Front Cover	Ketchum, MacLeod & Grove, Inc., Pittsburgh
Pioneer Rubber Co., The	44	Carr Liggett Advertising, Inc., Cleveland
Practical Mfg. Co.	31	Fischbein Advertising Agency, Minneapolis
Pyle National Co.	48	Calkins & Holden Agency, Chicago
Safety Tower Ladder Co.	54	Walter DuBree Advertising Agency, Los Angeles
Sargent-Sowell Inc.	51	Springfield Advertising Agency, Dallas
Standard Signs, Inc.	58	Kenneth H. Kolpien Advertising, Cleveland
Stonehouse Signs, Inc.	Inside Back Cover	Walter DuBree Advertising, Los Angeles
Tower Co., A. J.	52	Shattuck, Clifford & McMillan, Inc., Boston
United States Safety Service Co.	1	Phillips-Reick-Fardon, Kansas City
Wilkins Co., The	53	Lous Advertising, Inc., Ithaca

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INDUSTRIAL TRAFFIC SIGNS

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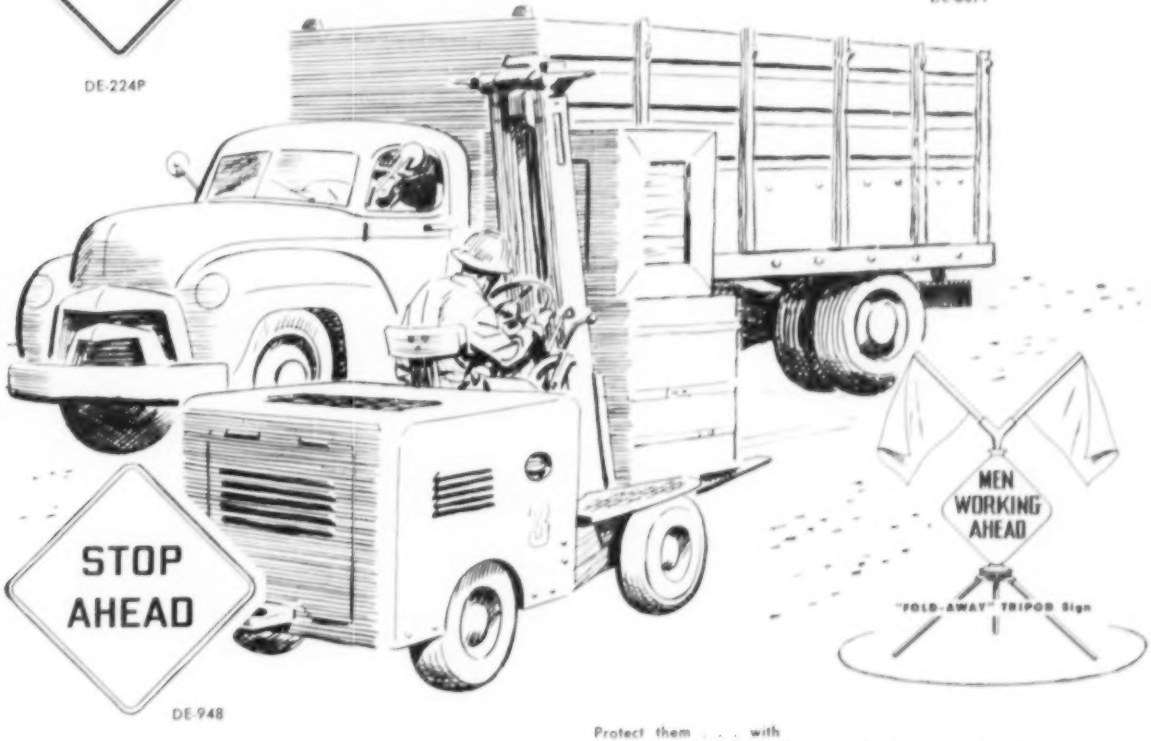
DE-637P

DE-224P



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INDUSTRIAL TRAFFIC . . . with its numberless trucks and other automotive vehicles, CAN be controlled and made safer for everyone.

Protect them . . . with

STONEHOUSE TRAFFIC SIGNS
For Accident Prevention

Just a few of these signs are shown here. Many more are available, in stock or special wordings, for prompt shipment.

- Send for Stonehouse Industrial Traffic folder. It's new, complete . . . free on request.

Stonehouse SIGNS, inc. • Stonehouse Bldg., 9th at Larimer • Denver 4, Colo.

MANUFACTURERS

"Signs Since 1863"

ACCIDENT PREVENTION • *steel* SIGNS IN STANDARD COLORS AND DESIGNS

(For details, use Key # T-25 on card on page 35)

MERCUROCHROME®

. . . for first aid

Neglect may cause infections, which can be prevented by prompt use of Mercurochrome.

No antiseptic has been proved to be more effective than Mercurochrome.

Thirty-six years of extensive clinical and lay use has proved the value of this popular antiseptic.

Thantis® LOZENGES

First aid for throat irritations . . .

Thantis Lozenges relieve pain promptly—reduce infection—act prophylactically.

Sore throats due to coughs and colds, if neglected, may result in lost man hours of work.

(For details, use Key # T-26 on card on page 35)

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